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Final Environmental Impact Statement for Remedial Action Standards for Inactive Uranium Processing Sites (40 CFR 192). Volume II

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The Environmental Protection Agency is issuing final standards for the long-term control of tailings piles at inactive uranium processing sites and for cleanup of contaminated open land and buildings. These standards apply to tailings at locations that qualify for remedial actions under Title I of Public Law 95-604, the Uranium Mill Tailings Radiation Control Act of 1978. This Act requires EPA to promulgate standards to protect the environment and public health and safety from radioactive and nonradioactive hazards posed by residual radioactive materials at the twenty-two uranium mi mill tailings sites designated in the Act and at additional sites where these materials are deposited that may be designated by the Secretary of the Department of Energy. The Final Environmental Impact Statement (Volume I) examines health, technical considerations, costs, and other factors relevant to determining standards. Volume II contains EPA's responses to comments on the proposed standards and the Draft Environmental Impact Statement (EPA 520/4-80-011).

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APPENDIX D: RESPONSE TO COMMENTS

Introduction

This appendix to the Final Environmental Impact Statement (FEIS) addresses all written and oral comments submitted to the Agency on the proposed disposal and cleanup standards for inactive uranium processing sites and the Draft Environmental Impact Statement (DEIS). Proposed Cleanup Standards for Inactive Processing Sites were issued on April 22, 1980 (45 FR 27370), and Proposed Disposal Standards for Inactive Processing Sites were issued on January 9, 1981 (46 FR 2556). The Draft Environmental Impact Statement was issued in December 1980. Public hearings on the proposed standards were held in Salt Lake City, Utah, April 24-25, 1981; in Durango, Colorado, April 27-28, 1981; and in Washington, D. C., May 14-15, 1981.

The method used in responding to comments was to assign comments to general subject categories. Within each category, comments of common concern were grouped, where possible, into composite comments that could be addressed by a single response. This procedure avoids duplication of comments and responses and aids finding a response according to its subject. Each comment is followed by one or more code numbers identifying the commenter(s) who raised the issue covered by the comment.

All substantive written comments (letters and written testimony) are reproduced in this volume (Appendix E) together with an index that provides a guide to locating the comments by a code number. Letters providing only editorial comments, notices of receipt, or with no comment have not been reproduced. Oral comments presented at the public hearings are not reproduced in Appendix E because of space limitations, but have been responded to. All written comments and hearing transcripts are available for review in Docket No. A-79-25, located in the U.S. Environmental Protection Agency, 401 M Street, S.W., West Tower Lobby, Gallery One, Washington, D. C. 20460.

Most responses to comments are intentionally brief and make reference to the FEIS (Volume I) or supporting references when more detailed technical information is appropriate. Where an adequate response required it, however, a more lengthy discussion of the technical considerations relevant to the comment is presented. We did not respond to a few comments indicating only general agreement or disagreement with the DEIS or standards, and which were not accompanied by any supporting data or arguments.

The Final Standards, referred to as 40 CFR 192, are in Appendix A in Volume 1 of the FEIS.

D.1 SCOPE OF THE STANDARDS AND THE DRAFT ENVIRONMENTAL IMPACT STATEMENT

D.1.1 Coverage of Standards and DEIS

Comment 1: EPA should set soil contamination standards for nonradioactive toxic substances, such as vanadium, cadmium, and selenium, which are found at inactive sites and could affect animals and vegetation. DOE could use these standards as a basis for setting cleanup priorities. (P-17)

Response: A discussion of soil contamination by nonradioactive toxic substances has been added to the FEIS in Appendix C. We conclude that standards for such contaminants would be only marginally useful if the land is cleaned up according to the radioactivity standards. After the required cleanup is completed, site-specific decisions for additional remedial actions can be made by DOE where they might be needed. We believe that the radioactivity standards, combined with information regarding the content of tailings and the use of land near the piles, provide a sufficient basis for DOE to set cleanup priorities.

Comment 2: EPA should set standards for radionuclide concentrations in vegetation on grazing lands and crop lands. The contamination of surface soils and vegetation from wind erosion of mill tailings piles can result in contamination of food products. (P-2)

Response: An evaluation of radiation doses from eating food contaminated by airborne material from bare tailings piles shows the risks to people from these pathways to be quite small (see Section 4.3.4 of the FEIS). Therefore, such detailed standards are unnecessary if tailings disposal and land cleanup are carried out according to EPA standards.

Comment 3: EPA should set standards for other radium-bearing materials, such as iron mill tailings, coal ash, and phosphate slag. These standards should incorporate a radon emanation coefficient. (S-19)

Response: EPA is authorized to set standards for such wastes under the Resource Conservation and Recovery Act. However, Congress has directed the Agency to study such wastes further, including phosphate slag and coal ash, before setting disposal standards. We have developed the remedial action standards for uranium mill tailings at inactive processing sites under PL 95-604 for the circumstances that pertain in and around those sites. EPA will first have to study the circumstances pertaining to other wastes before determining the need for standards for these wastes.

Comment 4: Phosphate mining and reclamation processes may result in an enhancement of the low level radiation levels that are naturally associated with phosphate ore. The proposed rules should not be used as a basis for future regulation of phosphate mining or reclamation processes because there is a lack of statutory authority for direct control of reclamation processes involving these low level radioactive materials, there are technical differences between the phosphate and uranium industries, and the State of Florida is addresssing the primary perceived concern, which is indoor radon decay product levels. (I-6)

Response: The subject standards were developed for appropriate remedial actions for uranium mill tailings at inactive processing sites. Standards for other wastes need not be same as these standards because the technical, economic and social considerations pertaining to those wastes may be quite different (See response to Comment 3, above).

Comment 5: The regulations do not cover radioactivity in water retention ponds, raffinate pits, etc., located on the premises of inactive processing sites; guidance should be provided for dealing with water used in processing uranium. (S-4)

Response: Some of the inactive mill sites have modest-size bodies of standing water containing radioactive and nonradioactive contaminants. We expect that sediments in such ponds are also contaminated. Site-specific remedial action plans will have to address disposal of the water in a manner that will minimize undesirable environmental effects, most particularly effects on surface and underground water. As discussed in the FEIS, we have chosen not to issue water protection standards. We are, however, providing guidance (see FEIS, Appendix A) that applies to the disposal of process water and other disposal activities that could affect water quality.

Comment 6: There should be radiation protection standards for workers who perform the remedial actions. (P-17)

Response: DOE and all other Federal agencies comply with general occupational radiation protection guides originally issued by the Federal Radiation Council (whose functions are now carried out by EPA). DOE will perform the remedial actions subject to specific occupational health and safety procedures that implement the general guides. We believe this program is adequate. EPA is reconsidering the general occupational radiation protection guidance, however, and may issue revisions before all remedial actions are completed. Federal agencies will then have to review the adequacy of their occupational radiation protection programs in light of the new guidance.

Comment 7: The FEIS should evaluate the impacts of existing ground water contamination and of excluding from the standards contaminated ground water that is within 1.0 kilometer of a disposal site. (F-7)

Response: Ground water contamination at inactive tailings sites is discussed in Chapters 3 and 4 of the FEIS. Available evidence does not show unambiguously that there is or will be contaminated ground water. If such contaminated water does exist, its effects would depend on the characteristics of the specific site and its uses. Under the Final Standards, water protection requirements will be determined site-specifically.

Comment 8: The expectation that other Federal agencies will take practical actions to avoid harm from contaminants that have already been released to ground water suggests possible overlaps in administration that might result in delayed solutions to ground water problems. Impacts of such an eventuality should be included in the assessment. (F-7)

Response: Whether or not EPA sets standards for existing ground water contamination, DOE, NRC, and affected States will have direct responsibilities for determining remedial actions for each site. Contrary to the comment, we believe EPA's approach (not setting standards) provides these agencies the flexibility they need to devise prompt solutions to ground water problems that may be found. Setting general standards that may be unrealistic for a specific site could delay that process (Chapter 8, FEIS).

Comment 9: The DEIS fails to provide the data needed to assess the impacts of the proposed ground water standards. EPA has also not adequately addressed new studies by Markos that suggest that surface water contamination may be a greater concern than was previously recognized. Therefore, as a preliminary step to formulating water protection standards, EPA should complete the following studies: (a) identify the problem through testing of water resources for radiological and nonradiological contaminants, and (b) present, explain, and apply more fully the recent studies that introduce new theories regarding movement of soluble contaminants. (P-17)

Response: We have reviewed available information on water contamination near inactive sites (see Chapters 3 and 4 of the FEIS). Although available information is incomplete, it suggests that surface water pollution from inactive sites is not a major problem and may not be a problem at all. The mechanisms Markos has identified for bringing soluble salts to the surface of a pile won't necessarily have significant consequences. The salts emerge gradually and are periodically swept away by rainfall. Streams and rivers near inactive uranium processing sites show little contamination from tailing piles even before remedial actions; we expect no worse afterwards. Therefore, we have not identified a need to conduct the studies recommended by the commenter before issuing standards, nor do we believe that Congress intended EPA to conduct such major studies before setting standards. However, if studies DOE has underway find a significant water pollution potential at any site, then DOE can apply appropriate site-specific remediations.

Comment 10: On a general level, the DEIS is very factual and well referenced. There are, however, technical deficiencies: there is a general lack of specific, on-site studies; data are incomplete; and the cost of remedial actions for each tailings site is lacking. (F-11)

Response: We have reviewed available data and improved the FEIS in this respect. We believe we used all significant and relevant information that is available about these sites. As we noted in the DEIS, such data are limited. However, greatly increasing the data base would require extensive assessment work in the field, which would further delay issuance of the standards.

We believe site-specific data are more important in determining necessary and appropriate remedial actions for each site than in deciding health and environmental protection standards that apply to all the sites. Site-specific information will be used by DOE in selecting remedial actions to meet the standards.

Comment 11: Many sites have been included in the remedial action program that should not have been. Table 4-1 of the DEIS projects that approximately one life per year is lost because of the high density of people living close to the Salt Lake City, Utah tailings site. This is a very substantial hazard that should be remedied. However, at Mexican Hat, Utah, only one life in 20,000 years is projected to be lost, with even smaller risks at Green River, Utah. Therefore, the site at Salt Lake City should be cleaned up as soon as possible, but remedial action at Mexican Hat and Green River should be halted until more substantial health hazards can be associated with them. (F-11)

Response: Congress established the eligibility conditions for remedial actions under Title I of PL 95-604 and determined that the program should cover the inactive processing sites at Mexican Hat and Green River, Utah. The comment cites our estimate of the lung cancer rates caused by direct radon emissions from various piles. We believe these risks may be a useful basis for setting priorities for remedial actions, but we do not believe they should be used as justification for postponing disposal indefinitely. We think reasonable actions should be taken now to avoid unnecessary hazards and potentially more difficult and expensive remediation in the future. (Also see response to Comment 2, Sec. D.3.1).

Comment 12: The only significant problem potentially associated with low level radium-226 concentrations in soils arises when buildings are constructed in such a way as to allow a buildup of indoor radon decay product concentrations. To impose remedial action requirements on all open lands is simply unnecessary. (I-6)

Response: While we agree that risk from the buildup of radon decay products in houses represents the greatest hazard from land contaminated with uranium mill tailings, we do not agree that this is the only significant hazard. Risk can also occur from high exposures to gamma radiation from tailings on the land. However, we have reconsidered the need to clean up contaminated open land at off-site properties and have concluded that a limited application of the cleanup standards for these sites will often be warranted (see Chapters 7 and 8 of the FEIS). The Final Standards require cleanup of contamination on land at offsite properties only when there is a reasonable potential for hazards in buildings on the contaminated land or where people are likely to be exposed to gamma radiation from the contamination for extended periods.

Comment 13: The disposal standards should provide for "exceptions" to account for local conditions. Although the proposed "Criteria for Exceptions" take account of the cost of meeting the cleanup standards, there is no such allowance for the disposal standards. There is no reason to treat cleanup and disposal differently with respect to applicable exceptions. (I-7)

Response: The final cleanup and disposal standards have been relaxed, compared to the proposed standards, to allow consideration of the practicality of remedial actions for the broad range of site-specific circumstances that exist at the various inactive processing sites. In order to provide for the orderly implementation of the standards in unusual circumstances, the Final Standards also allow the use of supplementary standards when certain criteria apply (see Section 192.21 of the Final Standards). However, the criteria involving cost relate to circumstances where the hazard can be well delineated, and the benefits of remedial action are determined to be unusually low relative to the costs. The potential benefits of disposal are long-term and cannot be determined nearly as precisely. In setting the disposal standards, EPA has made a broad judgment of costs that are warranted based on the current and potential future hazards of all tailings piles. We do not think it is necessary or appropriate to reconsider such broad judgments site-specifically.

Comment 14: The standards are proposed to apply "following any use of subsurface minerals at a disposal or repository site." This application is not authorized by PL 95-604, and there is no evidence or reason to justify it. (I-8)

Response: PL 95-604 requires EPA to "promulgate standards of general application (including standards applicable to licenses under Section 104(h) of the Uranium Mill Tailings Radiation Control Act of 1978) for the protection of public health, safety and the environment... at inactive uranium mill tailings sites and depository sites." Section 104(h) reserves the Government's right to sell or lease subsurface mineral rights on a tailings disposal site, subject to license requirements of the Nuclear Regulatory Commission, and requires that such sites shall be "restored to a safe and environmentally sound condition."

Comment 15: EPA has failed to comply with the requirements of Section 102(2)c of the National Environmental Policy Act (NEPA) because it did not give adequate consideration to the unavoidable adverse environmental effects associated with implementation of the standards. In particular, EPA has given little consideration to the environmental effects associated with stripping land to provide necessary cover material for tailings piles. (I-10, H-10, H-18)

Response: The environmental effects associated with implementing alternative disposal standards are considered in Chapter 8 of the FEIS.

Comment 16: EPA has not evaluated the socioeconomic impacts of the remedial action program on local communities, or given any consideration to potential impacts on the cultural/archeological resources of the area. (I-10, H-18)

Response: EPA has not specifically addressed these impacts in either the DEIS or FEIS because, in our view, such impacts are expected to be small and can only be properly addressed on a site specific basis. These impacts will be considered by DOE, as necessary, in preparing environmental impact statements or environmental assessments for remedial actions for the various processing sites.

Comment 17: EPA should not regulate according to the origin of the radionuclides. The standards should be based on health considerations. (P-6, P-15)

Response: The standards were developed for "residual" radioactive materials, as required by the Uranium Mill Tailings Radiation Control Act (PL 95-604). Different standards may be appropriate for other radium-bearing materials, because the factors determining the costs and benefits of controlling them may be quite different.

Comment 18: The DEIS does not note that the Federal Government may recover part or all of the costs of remedial actions, and thereby lessen their costs. This should be addressed in assessing the economic impact. (F-12)

Response: The comment refers to the potential liability under PL 95-604 of owners or operators of now-inactive processing sites for remedial action costs. Such liability has not been determined and any cost recovery is speculative. In any case, we do not consider the issue of who pays for remedial actions pertinent to assessing total economic costs. (Also see Section D.3.1, Comment 7).

Comment 19: Since major revisions in the environmental impact statement are necessary, EPA should issue a new DEIS for public comment. (P-17)

Response: Although we have revised and improved the environmental impact statement, we do not believe these revisions are of such a nature that it is necessary to issue a new DEIS. This would only delay promulgation of the standards and the health protection provided by them.

D.1.2 Form of Standards

Comment 1: The standards should specify that disposal sites should not be in a floodplain. (S-14)

Response: The major significance of being in a floodplain is that floods can disrupt disposal systems and disperse the tailings. However, disposal systems can be designed to prevent such disruptions. The effectiveness and longevity of a disposal system depend on the specific vulnerability of a site and the engineered features of the system. Therefore, a disposal site may be in a floodplain provided DOE selects and performs remedial actions that satisfy EPA's standards.

Comment 2: EPA should consider imposing deed restrictions on the use of a disposal site to avoid future disturbances of the cover. (F-8)

Response: EPA has no authority to impose deed restrictions, but PL 95-604 provides for Federal ownership of such tailings sites under licenses issued by the Nuclear Regulatory Commission. The Commission has authority to require the custodial agency to take any actions the Commission deems necessary to comply with EPA's standards and to protect public health and safety.

Comment 3: The rejection of a dose standard for disposal or a radon release standard is not well supported and consists of conclusionary statements (DEIS, pages 8-4 and 8-5). EPA should give more consideration to alternative forms of a radon standard, such as radon concentration, exposure, or dose. (P-17, I-10, F-14)

Response: The basis for the form of the radon standard is more fully discussed in Chapter 8 of the FEIS.

Comment 4: The language of the proposed standards implies that "reasonable assurance" and "reasonable expectation" will be provided to substantiate that the numerical values are nowhere exceeded after remedial actions. Unqualified numerical values could be interpreted to be absolute limits. Consequently, the remedial actions might have to achieve lower values than the standards so that unavoidable inaccuracies in measurement and sampling will not cause final conditions to exceed the standards. The problem could be avoided if the numerical values in the standards would be qualified as "goals" to be achieved within the accuracy of available measuring instruments used with reasonable survey and sampling procedures. (F-3)

Response: EPA used the word "reasonable" to discourage such extreme interpretations. We also stated in the Federal Register (45 FR 27370, April 22, 1980, and 46 FR 2556, January 9, 1981) and the DEIS that necessary measurements could be "performed within the accuracy of available field and laboratory instruments used in conjunction with reasonable survey and sampling procedures." Nevertheless, the Final Standards (see 40 CFR 192.20) provide general guidance on implementation so that our intended interpretations of the numerical limits will be more readily apparent to those who use the standards. (Also see response to Comment 5, below.)

Comment 5: Flexibility is needed in the cleanup standards to minimize costs and to avoid frequent use of the exceptions procedure. This flexibility should be provided in the standards themselves rather than in the preamble to the standards and the exceptions procedure. An exceptions procedure will be costly, time consuming, and difficult to implement. Standards should be expressed as a range of values rather than a single numerical value. (F-10, F-14)

Response: The Final Standards provide flexibility mainly through reasonably achievable limits, and we require only "reasonable assurance" that the numerical limits are satisfied. Guidance for providing "reasonable assurance" is provided in Subpart C of the Standards and Chapter 9 of the FEIS. However, there will be conditions for which a single numerical standard is inadequate and for which alternative standards or forms of standards are needed. The Final Standards provide for such conditions in several ways, including the use of a numerical range of values and of supplementary standards when applicable criteria are met. (Also see Comment 4, above).

Comment 6: In regard to the proposed indoor cleanup standard, Part 192.12(b), the DEIS states, "If the allowable level is still exceeded after all apparent tailings have been removed or otherwise prevented from affecting the interior of the building, then the standard does not require further remedial measures." This sentence should be revised because it seems to provide a loophole. Remedial measures should not end while an occupant's exposure to radon decay product concentrations from tailings is still considered hazardous to health. As a last resort, it may be that the exposure has to be eliminated by moving and compensating the occupants and/or owners. (F-8)

Response: The statement quoted applies to situations where it is believed that the indoor radon decay product concentration exceeds the level of the standard because of radioactivity sources other than tailings (such as normal earth under the building). We don't consider this a loophole because the remedial action program applies only to problems caused by tailings.

Comment 7: EPA should consider whether or not restrictions should be placed on land use options and ground water uses within an appropriate distance from the tailings piles. (F-6)

Response: EPA has no authority under PL 95-604 to impose land and water use restrictions. In general, we do not believe that such restrictions will be needed if the land cleanup and tailings disposal are carried out according to the standards. However, the implementing agencies (DOE, NRC, and the affected State) may consider the need for such restrictions site-specifically.

Comment 8: Since it will take at least several years to perform remedial actions, EPA should establish interim standards for controlling airborne particulates, access to the tailings sites, and erosion. (P-17)

Response: The main purpose of the remedial action program is to clean up tailings and dispose of them for a long time. We believe that any harm done during the time period before the remedial actions are undertaken will be small and interim standards are unnecessary. The commitment of resources to develop standards for interim controls would delay our issuance of final standards for remedial actions, and might delay implementing the standards. Therefore, we have concentrated on setting standards for the most significant aspect of the problem, the remedial actions.

Comment 9: EPA should set priorities for DOE's cleanup of contaminated structures. (P-17)

Response: EPA has no authority to set priorities for DOE. However, in accordance with Sec. 102(b) of PL 95-604, we have advised DOE on the health basis for setting remedial action priorities among the various inactive processing sites. We recommended in particular that "in carrying out remedial actions at a site, the first efforts should be directed to remediating elevated levels of exposure to individuals in occupied structures which are caused by the presence of tailings. This recommendation...may justify carrying out early remedial action at occupied structures even before remedial action is begun on the major portion of the residual tailings at an inactive processing site."

D.2 HEALTH RISK ASSESSMENT

D.2.1 Radiological Risk Assessment

D.2.1.1 Exposure Pathways

Comment 1: The EPA did not appreciate the potential seriousness of inhaled airborne particulates from mill tailings having a high specific activity, i.e., 10^4 - 10^5 pCi/g. (P-2)

Response: There is no evidence of an unusual hazard associated with the specific activity of inhaled particles. In extensive studies at the University of Rochester, monkeys and rats were exposed to UO_2 dust at a concentration of about 5 mg U/M^3 for 6 hours a day, 5 days a week for up to 5 years (Le70, Le73). This high concentration and long exposure produced little lung pathology and only 2 adenocarcinomas (in dogs). The animals were breathing 1 micron diameter particles with a specific activity of about 5.8×10^5 pCi/g. We believe these studies indicate that the inhaled uranium dust was not a potent carcinogen at these high specific activities.

In support of his contention, the commenter refers to tests of uranium metal dust carcinogenicity (Hu52), but this is not an appropriate comparison because inhalation was not involved. Rather, 50 mg of uranium metal dust in lanolin was either injected into the marrow cavity of the right femur or into the right pleural cavity. Cancers appeared only at the sites of injection. From comparison with the carcinogenicity shown by other metals used in the same experiments, it is unlikely that, under these experimental conditions, the effects were due to the radioactivity of the uranium.

We treated the hazard of inhaled particles on the basis of their metabolic pathways and organ depositions after inhalation using accepted ICRP dose models and organ specific risk calculations as outlined in the NRC Generic Environmental Impact Statement on Uranium Milling (NRC80).

Comment 2: EPA did not consider the impact of radioactive and nonradioactive elements on plants and/or animals foraging on the plants. (P-2, P-11)

Response: Protection of animals and vegetation was not explicitly addressed in the DEIS since we believe that if human health is adequately protected, the environment is also protected. Covering piles to prevent further erosion and cleanup of contaminated land in accordance with the standards will mitigate potentially toxic effects on plants or foraging animals.

Comment 3: The FEIS should address the possibility that radon dissolved in ground water will become a source of indoor air pollution via domestic water supplies. (F-7)

Response: EPA recognizes that geological conditions exist where water from deep wells can be an intermittent source of indoor radon. We do not believe this situation would occur due to the presence of an inactive tailings pile. A large amount of water would have to percolate through the pile and be transported to the point of use in the few days before the radon decays. Such an event is extremely unlikely. Wells for domestic use will not be allowed in the pile, and the very slow movement of ground water will allow more than enough time for the decay of dissolved radon. Moreover, piles complying with the Final Standards will have been covered or treated to substantially inhibit their radon releases to the air. In the semiarid regions where most inactive sites are located and soil evaporation rates are high, this should also prevent rain water from entering the pile and carrying radioactivity into the ground water.

Comment 4: The DEIS did not discuss the slow migration of piles as they erode and cover larger areas, potentially exposing people further away from the site. (P-17)

Response: Spreading of tailings by erosion is a major concern in the FEIS (see Chapters 3, 5, 7, and 8). An objective of the standards is to assure disposal of the tailings in a manner that prevents erosion and other events leading to spreading of tailings, and also to provide for cleanup of already contaminated areas. Therefore, if disposal and land cleanup are carried out according to the standards, such migration would cease for at least many hundreds to thousands of years.

Comment 5: The DEIS did not adequately consider the food exposure pathway, stating that the model used was "inappropriate for many of the inactive sites." Analysis of the food pathway should include sites like Mexican Hat where grazing is important. (P-2, P-17)

Response: The DEIS considered the radiation dose from eating vegetables, meats, and milk products contaminated by airborne materials from a bare tailings pile, i.e., before remedial measures are taken to prevent erosion. Even under these conditions, the risks associated with the food pathway are small. The evaluation of the food pathway in the DEIS was based on a similar evaluation in the NRC Generic Environmental Impact Statement on Uranium Milling (NRC80). As pointed out in the DEIS, this evaluation probably overestimates the dose in urban areas. However, it is appropriate for agricultural areas, such as Mexican Hat, Utah, where the potential risk from the food pathway is higher. A summary of our calculated health effects for all pathways (including grazing) from NRC's model mill (NRC80) is given in Table 4-9 of the FEIS.

Comment 6: The DEIS failed to consider potential health hazards to fish and wildlife. EPA should provide base-line information on radionuclides in fish, wildlife, and plants. (P-17)

Response: The DEIS did not assess the potential effects of radiation on members of wildlife communities. There is no scientific basis for believing that levels of radiation associated with tailings will have any significant impact on wildlife habitat.

Field studies by the NRC, DOE, and EPA have not identified any wildlife in jeopardy due to inactive tailings piles, even though only minimal remedial actions have been taken to reduce their impact on the environment. Mammals are more sensitive to radiation than birds, reptiles, fish, or lower types of animals. Even individual mammals burrowing in a pile are not expected to be affected adversely. Plants are very radiation resistant and should not be affected.

Comment 7: The possibility of biological uptake of radionuclides and toxic elements into plants piercing the protective tailings cover and subsequent transfer to animals and man should be discussed in the FEIS. (P-11, F-8)

Response: The uptake of radionuclides and toxic elements from tailings into plants is discussed in Appendix C of the FEIS. We have concluded that any such uptake would not represent a significant problem because the land areas are small, and, even if access to the tailings is not restricted, these plants would not represent the only food for animals.

Comment 8: The radon dispersion model appears to be based on a power function relationship observed by Duncan, et al., (Du77) between a set of measured radon concentrations and the corresponding distances from a tailings pile. Since some sampling stations in their study were heavily contaminated, the observations would be inappropriate for this purpose. (P-19)

Response: The commenter is not correct in his surmise that we used a power function dispersion model based on observations by Duncan, et al. Rather, for distances up to 7.5 mi (12 km), we used variations of the well-known models described in Chapter 3 of "Meteorology and Atomic Energy, 1968," particularly Equation 3.144 (Gi68). Our calculations for a sector averaged gaussian plume were corrected for the area of the source and then averaged over all directions to obtain circularly symmetric values. At distances between 7.5 and 50 mi, we adapted regional dispersion estimates made by Machta, et al. (Ma73), again averaging them over all directions. Further details of the dispersion models may be found in Section 4.3.2 of the FEIS and in a report by Swift (Sw81). (Also see Comment 9, below.)

Comment 9: EPA has overestimated the radon exposures resulting from emissions from inactive tailings piles. The models and assumptions used in the DEIS to calculate radon dispersion and radon decay product levels lead to higher levels than have been measured in the vicinity of inactive piles. More specifically, the dispersion model overestimates the radon concentration and incorrectly assumes a 50% decay product equilibrium out-of-doors. These factors cause exposures at close-in distances (Table 4-2 of the DEIS) to be overestimated by a factor of 10 or more. At 0.5 miles, the equilibrium is only 9% in outside air. (P-19, S-20, I-4, I-8, I-10, F-14)

Response: We agree that the degree of equilibrium in outside air near a pile is usually smaller than the value we used. However, this has little effect on the results since, as stated in the DEIS, we assumed that persons living near piles are not outside 24 hours per day, but are inside dwellings or other structures 75% of the time. Using the commentor's value of 9% outdoor equilibrium at 0.5 miles, the weighted average of indoor and outdoor equilibrium is about 54%, not 65.5% as we assumed in Table 4-2 of the DEIS. The difference is minor, but a revised table has been incorporated into the FEIS (Table 4-4).

The circularly symmetric atmospheric dispersion calculations we used are described in the FEIS and Sw81. We recognize that such a general approximation may not be appropriate for specific locations. However, dispersion models using site-specific data have shown reasonable agreement (a factor of 2) with measured long-term data in a number of validation studies (Ho78). While we would expect site-specific estimates of meteorological dispersion to be more precise at particular locations, we do not believe they are required for a generic assessment. In any case, the lack of adequate long-term meteorological data for each site makes such a consideration moot.

We have tested our approximations with site-specific data and found the deficiences to be relatively small. Haywood, et al. (Ha79) have published dispersion calculations for the Shiprock pile using local wind speed and direction data combined with stability data for the nearest weather station (in Farmington, New Mexico). At distances between 0.2 and 6.7 mi, the ratios of their directionally averaged dispersion factors to our estimates range from a low of 1.5 at 0.33 mi to a high of 2.3 at 0.83 mi. At 25 miles their estimate is higher by a factor of 7. The effect of directional asymmetry can be considerable: at a distance of 0.2 mi their estimates show a 6:1 variation with direction. This ratio increases to 15:1 at 6.7 mi and to 20:1 at 25 miles. Site-specific data yield dispersion estimates higher than ours in some directions and lower in others. The location-specific dispersion factors of Haywood, *et al*. are equal to or greater than the generic factors used by EPA at 106 out of 160 locations. While the EPA dispersion model is not precise, it does provide estimates that do not consistently exceed those using site-specific data, and which are adequate for our purposes.

Discrepancies between calculated concentrations and measured values of radon and radon decay products in the vicinity of a pile are caused by several easily understood factors. These include the assumed vs. actual radon emission rate from a specific pile, the generalized dispersion model vs. actual dispersion for the specific location of interest, and the inherent uncertainty of the measurements being compared with the calculated values. In the DEIS we used a single general model of a tailings pile. This general model fits some sites better than others, depending on how well the model assumptions are fulfilled at a specific locality. We assumed a dry pile without cover, such as would probably occur over the long term at an unstabilized inactive pile. Currently, many inactive-mill piles still contain excess process moisture, which inhibits the emission of radon, and some have partial or temporary cover materials as well. Our estimates of ultimate radon emission (i.e., from a dry, uncovered pile) are based on the average concentration of radium in the pile and are typically about 1.7 times larger than measured values (Table 3-1 of the FEIS). Our estimates of the average radium concentrations in specific piles are calculated from the processing records of the mill operations that created the piles. Actual measurements of radium in the piles indicate that the radium content varies considerably throughout a pile, so that measured emissions may not reflect the average value. Even though limited exhalation rate measurements have been made at most piles (Table 3-1 of the FEIS), we do not believe they provide a more reliable long-term estimate than the calculated values we used.

Although we recognize the limitations in our ability to predict radon concentrations, we have little faith in estimates of long-term averages based on radon measurements limited to a short span of time or to a relatively small sample of meteorological conditions. It is well known that short-term radon concentration at a location can vary by orders of magnitude with time. Even the long-term averages cited by the commenter vary by a factor of 3 or more between the sampling stations used to determine an average background value. Ascertaining the contribution of a particular source of radon to the measured concentration at a particular location is difficult at best.

In any case, our assessment does not rely solely on calculated radon concentration values. Table 4-5 of the FEIS lists risk estimates based on measured radon concentrations in outside air.

D.2.1.2 Risk Models

Comment 1: In spite of inhaled radon not being a carcinogen in animals, the EPA radon risk estimates have not included the effect of other factors besides radon in the induction of lung cancer in uranium miners, e.g., smoking and insoluble alpha-emitting particles. (P-2)

Response: Early epidemiological investigations failed to recognize that radon decay products attached to particulates, rather than radon gas, are the primary cause of high bronchial exposure. This has led to much of the speculation on the contribution of factors other than radon to the induction of lung cancer in miners. This same failure was repeated in early animal experiments with relatively pure radon. Hueper reviewed reports showing that microorganisms, silica, nickel, cobalt, arsenic, fungi, radium, inbreeding, heredity, and colds did not play a part in the induction of lung cancer in miners exposed to radon and radon decay products (Hu66, Hu42).

Recent experiments in the United States and France have shown that radon/radon-decay-product exposure alone can induce lung cancer in experimental animals, and that smoking in some cases may be protective (Cr78, La78). Since the lung cancer induction potential of radon/radon-decay-product exposure has been amply demonstrated and the special potential of high specific activity particles is speculative, there should be no need to develop a special risk assessment procedure for the high specific activity particles. (See also response to Comment 1, Section D.2.1.1)

Comment 2: Differences between the cumulative dose, dose rates, and conditions of exposure for underground miners and the general public are such that the Agency's estimates of the risk due to inhaling radon decay products are likely to be invalid at exposure levels as low as 0.015 WL. EPA should limit its basis for the standards to data obtained from studies at low doses. (I-7, F-2)

Response: As stated in the FEIS (Section 4.4.1), we recognize that estimates of risk to the general population that are based on occupational exposures are not exact. Nevertheless, we believe they are useful for examining the risk potential from inactive tailings piles and other radon sources. The comment seems to be based on the thought that low dose rates and low doses are intrinsically less damaging, per unit dose. Although this is being debated for lightly ionizing radiations, carcinogenic effects of highly ionizing radiations are not reduced at low doses and low dose rates (NP80, NAS80a).

Indeed, for radon, there is evidence that at high exposures, effects per WLM are less than at low levels. For these reasons, we believe a linear extrapolation of low-dose occupational data to environmental levels is not unduly conservative. Moreover, the lifetime cumulative exposure at 0.015 WL is about 20 WLM, not a great deal less than cumulative exposures of miners (60 WLM) who have died of radiogenic lung cancer (He79). The increased number of lung cancers observed in Ontario uranium miners in the range from 0 to 30 WLM, while not statistically significant, is fully consistent with the risk observed in these miners at much higher levels of exposure (He79, Ch81). Finally, we reviewed other potential causes of lung cancer associated with hard rock mining in EPA-520/4-78-013 (EPA79), and concluded that there is no evidence that anything other than radon decay products are the cause of the excess lung cancer that has been observed in persons working in a variety of mines having a wide range of suspected co-factors for carcinogenesis. A recent report by the Ontario Government arrived at a similar conclusion (Mi76). (Also see response to Comment 13, below.)

Comment 3: The risk estimates may not be sufficiently conservative due to EPA's use of a linear extrapolation from high to low exposure levels. The predominance of uranium miner data shows a concave downward curve at lower exposure levels. The specific relative risk coefficient selected may compensate somewhat for this. (F-9)

Response: Although there is evidence that the carcinogenic response per WLM at exposures greater than a few hundred working level months is less than at lower levels, there is no conclusive data indicating a significant departure from linearity at low levels. Sampling uncertainties in the epidemiological data are so large at low exposures that a somewhat greater response would not be apparent. Moreover, given the uncertainty in the miner data and its application to a general population, any small departure of the response from linearity is unlikely to change the risk estimates significantly.

Comment 4: The DEIS gives four different values for the lifetime absolute risk factor, ranging from 3.0 to 11.1 per 10,000 person WLM. (P-19)

Response: The DEIS contained only one absolute risk estimate. This estimate of lifetime risk for lifetime exposure was expressed in two ways: 1) as the lifetime risk to an average individual; and 2) as the average annual risk to an exposed population. One risk coefficient, 10 cases per 10^6 person-years at risk per WLM, was used to generate these absolute risks. It provided an input coefficient for a "life table" calculation that accounts both for the probability that a person is still alive at a given age and for the person's cumulative exposure. The life table analysis is discussed in a recent paper by Bunger, et al. (Bu81).

The four absolute risk estimates attributed to EPA are neither in the DEIS nor implied in it. Rather, the commenter derived them using his own assumptions and models. These assumptions and models differ from those used by EPA and, hence, produce different numerical answers. The commenter's absolute risk estimates of 3.0 x 10^{-4}/WLM and 3.7 x 10^{-4}/WLM for an individual assume everyone dies at age 70, an assumption not made by EPA. EPA's calculations are based on U. S. mortality data, and include the risk to that portion of the population that lives longer than age 70. While EPA's method is better, the commenter's approximation is not too bad. EPA's absolute risk estimate in terms of lifetime risk per WLM is 3.5 x 10^{-4}.

The commenter's estimate of 7.1 x 10^{-4}/WLM evidently assumes that EPA's procedure of dividing a life table calculation of total excess cancer by the average age at death, as outlined on page 4-9 of DEIS, is the same as multiplying the risk coefficient used in life table analysis by 71 years. However, the risk coefficient is not the risk estimate, but only one of several parameters used in a life table analysis (Bu 81).

The fourth risk estimate cited by the commenter, 1-3 lung cancer deaths per year of exposure for 100 person-working-levels, is a range with an absolute risk estimate as a lower limit and the Agency's largest relative risk estimate, one that includes the possibility that children are more sensitive to radiation than adults, as an upper limit (see page 4-9 of the DEIS).

Comment 5: The absolute risk factors used by EPA were derived from unpublished data, were never given peer review, and relate only to underground uranium miners. (P-19, H-16)

Response: EPA used a single absolute risk coefficient. This risk coefficient is given in a report prepared by the National Academy of Sciences: Health Effects of Alpha-Emitting Particles in the Respiratory Tract (NAS76). As noted on page ii of the report, it was reviewed by a Report Review Committee selected by the Academy. We consider this peer review. The risk coefficient used in the DEIS, 10 cases per 10^6 WLM-person-years at risk, is equal to the smallest of the age-dependent risk coefficients (10-50 cases per 10^6 WLM-person-years at risk) given in the 1980 NAS BEIR III Report (NAS80a). The DEIS clearly stated that estimates of risk in the DEIS were based on studies of miner health and that risk to the general population could be larger or smaller. We agree that differences between miners and the general public could be important (see Section 4.4.1 of the FEIS).

Comment 6: The WLM unit of exposure is the product of the radioactive concentration (WL) in the inhaled air and the duration of exposure (M) in units of the nominal 170-hour working month. For one year of constant exposure, 1 WL-yr = 51.5 WLM. The relationship 1 WL-yr = 27 WLM used in the DEIS on grounds of differences in breathing rates is inaccurate, since this difference is just one of many parameters which enter the estimation of the lung cancer risk factor for the general population. (P-19)

Response: The commenter is correct in that the unit WLM was developed for occupational exposure. However, radiation protection is already overloaded with quantities and units that are poorly understood by the public. Therefore, rather than invent a new unit for nonoccupational exposure, cumulative exposures of the general public are expressed in the EIS and elsewhere (RPC80) in occupational units, taking into account the larger number of hours exposed per year and the reduced breathing rate appropriate for members of the general population as compared to underground miners. This quantifiable procedure is, in our opinion, preferable to including these factors in an unquantified and undocumented risk reduction factor for the general population.

Comment 7: The 0.75 occupancy factor for a residence is too high. Probably an average in the vicinity of 0.5 or less would be easy to justify. For a work place, the occupancy factor is 0.23. (P-19)

Response: We agree that 0.23 is appropriate for duration of exposure in a work place, when such activity averages 170 hours per month. On the other hand, a 0.5 occupancy factor implies only two hours per day in the home in addition to eating and sleeping. This is too low. We note that a 75% occupancy was used by the Radiation Policy Council (RPC80).

Comment 8: For the low-level radon exposure of the general population, the recently published recommendation of six widely recognized senior specialists from four countries should be used to estimate risk. This is a lifetime risk with an upper bound of 1 per 10,000 WLM, and with a lower bound that may include zero. (P-19, I-4, I-10, H-13, H-18)

Response: One of the reasons estimates of lifetime risk are tenuous is that there are no studies of exposed groups that extend over the survivors lifetime. Therefore, all estimates include (either explicitly or implicitly) a projection of what the future risk of exposed groups will be. In real life, it is observed that no excess cancer occurs for a few years after exposure. This is the so-called "latent period", but more properly termed the "minimum induction period." After the latent period, excess radiogenic cancers are observed in the group for a number of years that varies with cancer type. A few radiogenic cancers, e. g., leukemia, appear to have a relatively short period of increased risk, 25 years or so, after the latent period. However, lifetime follow-up studies have as yet to confirm these observations. The period at risk for other cancers appears to be much longer. For cancers other than leukemia and bone cancer, the BEIR III Committee (NAS80a) assumed the excess risk would be expressed over the balance of a person's lifetime (after the latent period). Again, this is unconfirmed by lifetime follow-up data, but is consistent with observations to date. Finally, while the Japanese survivor data should eventually allow the period of risk to be estimated rather well for persons of various ages, data on excess lung cancer among underground miners is less helpful, since exposures generally occurred over many years and the age at which exposure started covers almost the entire adult work life. Therefore, in considering the validity of risk estimates, it is necessary to examine their underlying assumptions, including the assumed length of time a person is at risk following exposure.

The upper limit of the range of risks cited by the commenter, 1×10^{-4} per WLM, is apparently based on an analysis by Myers and Stewart, who are scientists at the Chalk River Nuclear Laboratories (My79a, My79b). These authors project 0.21-0.54 lung cancers per 10^4 WLM, on the basis of U. S. uranium miner experience through 1968, and about 0.6 to 1.6 lung cancers per 10^4 WLM based on the Czechoslovakian miner data. Although these estimates are presented as lifetime risks, they actually assume radiogenic lung cancers occur no more than for 15 years, following a ten-year latent period. We believe that assuming such a short period of increased risk leads to an underestimation of the total detriment. Although no exposed group has been followed for a lifetime, there is ample evidence that radiogenic lung cancers occur more than 25 years after exposure. The best data on this is for the Japanese survivors, who, unlike underground miners, are known to have been exposed only once and on a known date in 1945. The excess of lung cancer in these survivors has been nearly constant from 1959 to 1978 and has shown little or no tendency to decrease with time. Indeed, Land (Lab78) has shown that for older A-bomb survivors the incidence of radiogenic lung cancer follows the same age distribution as nonradiogenic lung cancer (i.e., increasing with age). Both Lundin and Hewitt (Lua79, He79) have shown independently that Land's findings are consistent with the pattern of age at death observed in U. S. and Canadian uranium miners. It should be noted that lung cancer is most prevalent in persons 70 or more years of age. Therefore, a very long follow-up time is needed to observe the full extent of radiogenic lung cancer.

We believe about 60 years at risk, not 15 years, is a more realistic measure of impact for persons exposed to radon decay products from birth. The commenter's lifetime risk estimate of 0.6 to 1.6 lung cancers per 10^4 WLM, based on the Czechoslovakian data, should therefore be four times higher, i.e., 2-6 lung cancers per 10^4 WLM. The EPA absolute risk estimate is in the middle of this range; the EPA relative risk model yields estimates somewhat larger than 6 per 10^4 WLM; i.e., about 8.6. We do not know why the U. S. mortality studies reflect less radiogenic lung cancer than the Czechoslovakian data, but note that the U. S. data used by Myers and Stewart are for excess lung cancer occurring before October 1, 1968. The number of excess lung cancers occurring in this group through September 1974 has nearly tripled, 159 vis a vis 62, (NAS80a, Lua71). Moreover, most U. S. uranium miners were exposed to very high levels of radon. There is a trend for fewer excess cancers per WLM with increasing levels of exposure, as noted in BEIR III (NAS80a).

It is difficult to find any quantitative analysis or scientific rationale for the lower limit of zero risk attributable to radon decay products that the commenter recommends based on estimates of Evans, Harley, Jacobi, McLean, Mills, and Stewart (Ev81). Myers' and Stewart's analysis, which provided the basis for the commenter's upper bound of risk, also included consideration of the possibility of a threshold (My79a). Meyers and Stewart concluded that "the quasi-threshold region is less than 3 WLM." We note that a 3 WLM exposure would be received in the first ten years of occupancy in a residence having a radon decay product concentration at the proposed limit, 0.015 WL. While Myers and Stewart reported that the miner data did not rule out a quasi-threshold, they also stated that the "the mathematical analysis using the criterion of maximum likelihood does not provide any reason to reject the more conventional linear dose response relationship."

We believe it is prudent not to assume a threshold for radiogenic cancer unless it is demonstrable. We agree that the risk to the general population from a given concentration of radon decay products is less than for working miners who inhale more air, and we have corrected our estimates of cumulative exposure accordingly (see response to Comment 6 above). However, we have not identified evidence for other causes of a reduced risk to the general population as compared to miners. As stated in the FEIS, risks to the general population could be greater or less.

Comment 9: The DEIS considered only lung cancer in its discussion of health effects. The limited view of health effects in the DEIS resulted in narrowing the types of standards proposed by EPA. (P-17, H-23)

Response: Tables 4-7 and 4-9 in the DEIS included estimates of the risk of fatality due to leukemia and all solid cancers. Table 4-10 listed the estimated risks for serious genetic effects. Effects of nonradioactive toxic substances were considered in Chapter 4 and Appendix C. Chapter 4 of the FEIS discusses why the risk of lung cancer is thought to be the predominate radiological risk from tailings. However, the proposed standards limiting radium-226 in soil and external gamma radiation reflect the Agency's concern about other health effects.

Comment 10: The DEIS estimates of risk utilized 1970 population figures and did not take into account increases since then. (P-17, F-9)

Response: Increases in population since 1970 are small compared to the uncertainty in the risk estimates. Moreover, estimates of the risks to persons residing in the vicinity of a pile depend critically on the exact location of residences and work places (see Table 4-4 in the FEIS). New census tract information, not yet available, could show increased or decreased risks for a larger population, depending on where they lived. As stated in Section 4.4.1 of the FEIS, the Agency believes it is sufficiently prudent to use current data.

Comment 11: Did the calculations of lung cancer risk take smoking into account? If this was ignored, smoking could actually increase the risk following radiation exposure. (F-8)

Response: Estimates of lung cancer risk are based on epidemiological studies of underground miners. For the most part, smoking was more prevelant in these groups than the general population. Therefore, we do not believe the risks have been underestimated.

Comment 12: EPA has failed to set forth the rationale for the various risk projection estimates. EPA risk estimates were evidently derived from an unpublished paper by V. E. Archer entitled "Factors in Exposure Response Relationships of Radon Daughters." (I-4, H-18)

Response: The relevant EPA risk estimates and their rationale were published in February 1979 (EPA79). In this report, which was cited in the DEIS, there are 25 pages of information on the assumptions used in the EPA analysis and our reasons for making them. Archer's paper was published in January 1979 by the Colorado School of Mines Press (Ar79). Only Fig. 4-2 in the DEIS was taken from Archer's report. It was used to illustrate the sampling uncertainty in the epidemiological data. The Agency's health risk estimates were published in the same conference proceedings as Archer's paper and were derived independently.

Comment 13: Because cellular repair processes can mitigate radiation damage, the Agency's total reliance on the linear nonthreshold model is unduly conservative and overstates the risk posed by radon exhalation from tailings. (I-4)

Response: The comment fails to differentiate between the effects of lightly ionizing radiations and highly ionizing radiations like alpha particles from radon decay products. Repair of cellular injury from lightly ionizing radiations is usually demonstrated by dividing the total dose into 2 or more fractions and measuring repair between succeeding dose increments. However, epidemiological studies of bone cancer and several animal studies indicate that fractionated doses from alpha particles and other highly ionizing radiations are likely to cause more cancer per unit dose rather than less. Moreover, radiocarcinogenicity of highly ionizing radiations is apparently enhanced at low-dose rates compared to higher dose rates (Sp73, Frb81). Given this evidence, we do not believe it is prudent to assume repair of alpha particle damage of bronchial cells on an ad hoc basis. We note that the NCRP (NP80), the NAS (NAS80a), and the ICRP (IP77) are unanimous in their use of the linear nonthreshold dose-response model for highly ionizing radiation. Moreover, Myers and Stewart (My79a, My79b) have demonstrated that response functions other than linear provide poorer fits to the epidemiological data for radon exposures than a linear response.

The Agency acknowledges that none of these data and arguments definitely precludes a nonlinear response at low doses, or even a threshold at some level of exposure. Nevertheless, the preponderance of evidence does indicate that use of a linear nonthreshold response is not overly conservative. Indeed, there is some discussion as to whether it is conservative enough (see response to Comment 3, above).

Comment 14: EPA's exclusive reliance on a linear nonthreshold response function is inconsistent with pertinent epidemiological surveys comparing levels of background radiation to cancer mortality. (I-9, H-11)

Response: It should be noted that the surveys cited in the comment are not epidemiological studies comparing the incidence of cancer in irradiated and nonirradiated subjects, but rather attempts to look for a geographical correlation between cancer incidence and changes in background radiation. While such studies may be suggestive of a possible cause and effect (and occasionally are useful for identifying contaminants for further investigation), they are not a good tool for excluding a particular cause of excess cancer when the influence of this cause is small compared to other variables. Geographical surveys are limited to detecting relatively large environmental effects because of the problems of comparing dissimilar groups. Populations in different parts of the country differ in many ways, only some of which have been partially accounted for by regression-type adjustments. Examples are: ethnic background, diet, occupation, social and economic factors, and population movement. In view of the unknown etiology of cancer and the difficulty in capturing all of the potential confounding factors in the regression model, the credibility of causal inferences from such data is small.

Such studies have usually aggregated potential radiogenic and nonradiation related cancers, used obsolete estimates of background radiation levels, and placed a faith in death certificate data that is unwarranted. For the Japanese atomic bomb survivors, a population studied more intensely than any U. S. population, autopsy data show poor agreement with death certificates. For example, less than 61% of the death certificates listing lung cancer as the underlying cause of death are found to be correct at autopsy (Yaa78). In the United States only 18.4% of the deaths occurring in 1979 had an autopsy reported, and most of these were forensic cases (HEW76).

Comment 15: Although more than 20 years has elapsed since uranium mill tailings were widely used as a source of building materials in Grand Junction, Colorado, no increase in the incidence of lung cancer has been found. Indeed the incidence of lung cancer in Mesa County is no greater than the incidence in five surrounding counties. (I-8, I-10)

Response: We present estimates of the health effects of tailings piles at inactive sites in Chapter 4 of the FEIS. For tailings used in buildings in the Grand Junction area, we specifically estimated that 150 excess lung cancers would occur over 70 years if remedial action were not taken. Because of the factors discussed in our response to Comment 14, above, we expect geographic surveys not to unambiguously detect such cancers occurring at the rates we have estimated.

Comment 16: None of the regulatory agencies have dealt with the known reality of a latency period in estimating the risk of radiogenic cancer. This makes me think that experiments on dose rate effectiveness factors are simply misinterpreted and poorly designed. (H-24)

Response: Dose rate effectiveness factors were not used in preparing EPA's risk estimates. Because of the long latency associated with lung cancer, the excess cancer observed in ongoing epidemiological studies cannot be used directly for quantitative risk estimates. Rather, a projection model must be used to apply the rate observed after the minimum latent period to the total period of time persons will be at risk following exposure. EPA risk estimates are based on a ten-year minimum latent period and a period of risk lasting throughout the remaining lifetime of the exposed individuals. This practice is the same as that followed by the 1980 NAS BEIR III Committee (NAS80a), and is compatible with the available data.

Comment 17: It has been demonstrated that, as exposures decrease, the latent period for cancer induction increases, so that for small enough exposures the latent period is longer than life expectancy, and cancer will never develop. This effect will show up as a threshold, in contrast to the linear nonthreshold model of carcinogenesis utilized by EPA. (H-5)

Response: The minimum latent period, the length of time between the insult and the expression of a statistically significant increase in the expected number of cancers, is a random variable that depends on experimental design as well as physiological processes. Therefore, observed latency is a property of the exposed population as a whole and includes consideration of fluctuations in the expected cancer rate as well as the variation over time of induced cancers. If the carcinogenic insult is large, excess cancer may be observed almost as soon as physiological processes allow, and a statistically significant excess is observed shortly afterwards as an increasing number of the subjects respond to the carcinogen. For low-level exposures the number of excess cancers over time will be fewer; since the signal-to-noise ratio is lower, the period of observation required to demonstrate a significant increase will be greater, even if the physiological processes leading to cancer are identical. Indeed, at sufficiently low exposure levels no statistically significant excess will be observed in a sample of a practical size. It follows, therefore, that there will be an apparent shift to longer latency periods as exposures are reduced. This is not a physiological shift in carcinogenic processes, but rather an artifact inherent in experimental design.

In addition to this artifact, there may indeed be a real shift to longer latency at low doses, as is sometimes observed with low-LET radiation in animal experiments. However, even for these cases, a practical threshold for carcinogenesis cannot be experimentally demonstrated. Fractionation of a given dose into small dose increments would be expected to reduce its carcinogenicity if latency increases as the dose rate is reduced. For highly ionizing radiations, however, like alpha particles from radon decay products, fractionation increases the likelihood of cancer in both humans and in animals (see response to Comment 13, above). In view of these findings, we believe the hypothesis of a practical threshold is highly speculative and not a sound basis for the development of radiation protection standards. We note also that neither the ICRP nor the NCRP has endorsed the use of a practical threshold for injuries arising from stochastic processes, i.e., cancer and radiogenetic effects.

Comment 18: There are significant and verifiable nonmalignant respiratory effects as well as nonrespiratory malignant effects that are associated with radon and its decay products. The literature provides verifiable information on these types of health effects and they should be factored into a revised DEIS. (H-23)

Response: The commenter cites Table 3 in "Respiratory Disease Mortality Among Uranium Miners" (Ar76) as support for these contentions. The same Table 3 indicates that cancer at sites other than lung cancer was slightly below expectation in U. S. white underground uranium miners. While there are reports of excess skin cancers occurring among Czechoslovakian underground miners working with uranium ores high in arsenic content, the incidence of these skin cancers has remained the same over time even as radiation exposures were decreased. We know of no other published evidence indicating a cancer risk to organs other than the lung due to radon decay product inhalation.

Archer (Ar76) attributes the observed incidence of nonmalignant respiratory disease to "pulmonary insufficiency resulting from diffused radiation injury to lung parenchyma." Such nonstochastic injuries are not unexpected at high doses, but do not occur at low doses (IP77). Pulmonary injuries are not believed to occur in the general population at the comparatively low levels of radon decay product concentration encountered outside of uranium mines.

Comment 19: EPA has failed to issue standards based on realistically valid health effects (risk) data. (F-15)

Response: Our estimates of health risks from inhalation of radon decay products are based on epidemiological studies of uranium and other underground miners and on two reports, "The Effects on Populations of Exposure to Low Level of Ionizing Radiation" (NAS72a) and "Health Effects of Alpha Emitting Particles in the Respiratory Tract" (NAS76). Information in the report of the United Nations Scientific Committee on the Effects of Atomic Radiation (UN77) was also considered.

We recognize that extrapolation of data from underground uranium miners to the general population leads to uncertain risk estimates in (see Chapter 4 of the FEIS). We are also aware that there are differing views on the magnitude of the risk from inhalation of radon decay products. However, we believe our risk estimates are appropriate for setting health standards.

Comment 20: The relevant assumptions and calculational methodologies used in the risk assessment should be included in an appendix to the FEIS. (F-10)

Response: This material has already been reported in several publications. EPA 520/4-78-013 (EPA79) is available from the Office of Radiation Programs, USEPA, Washington, D. C. 20460. The material has also been published as "Environmental Hazards from Radon Daughter Radiation" in the 1978 MSHA-sponsored Conference/Workshop on Lung Cancer Epidemiology and Industrial Applications of Sputum Cytology, Colorado School of Mines, January 1979.

D.2.2 Nonradiological Risk Assessment

Comment 1: The EPA has not adequately assessed the health effects due to nonradioactive toxic elements in tailings. The assessment in the DEIS fails to consider certain elements, pathways, and health effects, and impacts on fish, animals and plants. (P-11, P-17, H-23)

Response: The comment is partly correct. However, it is not possible to address all possible elements, pathways, and effects in the DEIS. Rather, we addressed what we believed to be the most important considerations relative to toxic elements in tailings. We have further reviewed the available information and have expanded our treatment of the subject in the FEIS (see Sections 4.3.4, 4.4.3, and Appendix C).

D.3 Rationale for Standards

D.3.1 Basis for Standards

Comment 1: The rationale for selecting the Proposed Standards is unclear. The DEIS presents an inadequate consideration of alternatives to the proposed standards. Health risks have not been considered for any of the standards except the radon release rate. EPA should carry out a cost-benefit analysis for each of the standards promulgated. The analysis should present a systematic comparison of the costs and benefits of alternative standards, which include both more and less restrictive standards, as justification of the standard selected. (P-17, I-4, I-10, F-9, F-10, F-14, H-9, H-10, H-18)

Response: The FEIS provides extensive analyses of realistic alternatives to the proposed standards, including detailed evaluations of their costs and benefits (see Chapters 6 and 7 of the FEIS).

Comment 2: It is inappropriate to set general standards applicable to remote tailings sites based on estimated collective risks to people living near tailings piles in urban areas. The proposed standards make no allowance for tailings disposal at remote inactive sites. (I-7)

Response: Reducing the risks to the populations living near the tailings piles from direct radon emissions is only one of the objectives of the standards. Radon emissions also affect distant populations. Other objectives include isolating the tailings to prevent wind and water erosion and public access to them. The greatest hazard from tailings occurs when they are removed from the pile and used in and around buildings. Therefore, a major objective of the standards is to isolate the tailings to discourage such use. The longer piles are not properly stabilized, the more extensively weathering and people will spread the tailings and, thereby, increase the eventual costs for cleanup at remote sites. Furthermore, populations near the piles can increase in size dramatically over even a few decades.

Comment 3: The Federal Register notice proposing the cleanup standards (45 FR 27370, April 22, 1980) states that "it must be possible to accomplish the requirements (of a standard) in a reasonable time with the techniques and personnel available." What does "techniques and personnel available mean?" (P-5)

Response: We meant that it should be possible to satisfy the standards using existing techniques and labor pools without extensive technology development or personnel training programs.

Comment 4: The costs of the disposal standards are very high relative to the health effects that will be averted. (P-23, I-4, I-8, I-10, F-14, H-2, H-18)

Response: We have reevaluated the costs and health benefits of the disposal standards and have revised the standards based on this analysis. We believe the Final Standards provide nearly as much benefit as those we proposed, for substantially less cost. Chapter 6 of the FEIS presents an analysis of alternative disposal standards.

Comment 5: EPA has not adequately considered the risks to workers and the general public from earthwork and trucking activities (including transportation of tailings to a new site) performed to meet the disposal standards. EPA should discuss these risks in the FEIS and consider them in setting the standards. (P-17, I-4, I-10, F-8, F-15, H-18, H-23)

Response: The risks to remedial action workers and the public for various tailings disposal options have now been analyzed (see Section 6.4 of the FEIS), and were considered in selecting the Final Standards.

Comment 6: As Congress has determined that proper isolation of tailings is needed, the standards should be sufficient to insure that the piles are not left at marginal sites. (S-14)

Response: Congress stipulated that DOE will perform remedial actions to comply with EPA's standards. The standards require that account be taken of both site characteristics and engineering limitations. We believe, for example, that dikes and other erosion control technologies can provide a significant enhancement of a site's natural stability characteristics.

Comment 7: EPA should consider it the social responsibility of the uranium mill owners to clean up their own mess--if possible. (P-21)

Response: EPA's mandate under PL 95-604 is to set standards for remedial actions, not to assess responsibility. The Department of Justice, however, is required by Section 115 of PL 95-604 to determine whether any person who owned, operated, or controlled any of the inactive processing sites is legally liable for reclamation or remedial action costs.

Comment 8: The Proposed Standards are too close to naturally occurring levels of radium and radon. (F-15, H-2, H-5)

Response: In developing the remedial action standards, EPA took into consideration naturally-occurring radioactivity levels. A discussion of these levels are included in Chapter 3 of the FEIS. Because the Proposed Standards were close to background levels, a number of potential problems in implementing them were identified during the comment period. To avoid remedial actions where costs are high relative to their small potential benefits, and to simplify the measurement problems, the Final Standards have been set at levels more readily distinguishable from background than the Proposed Standards.

Comment 9: The Proposed Standards are inadequate because they are based on the standards for maximum levels recommended by the BEIR Committee. (P-14)

Response: The comment is incorrect. First, the BEIR Committee did not recommend standards; rather, at EPA's request they reviewed the scientific evidence on the risk associated with low levels of radiation. EPA used these estimates, in part, to assess the risks associated with tailings. Second, our Proposed Standards were based on an assessment of the degree to which hazards could reasonably be reduced, taking account of costs, technical, and social factors.

D.3.2 Cost Estimates

Comment 1: EPA has underestimated the costs to implement the Proposed Standards. Cost estimates are too low by a factor of two or more. (I-3, I-10, F-14, H-13, H-18)

Response: Cost estimates used in the DEIS were expressed in 1978 dollars. Costs of some construction activities, especially those that are sensitive to shifts in energy costs, have increased substantially between 1978 and 1981. We have revised our cost estimates to reflect these changes and have also included previously omitted costs for engineering, field supervision, contingencies, and for reclamation of borrow pits. Our cost estimates for specific remedial activities now approximately agree with those provided us by industry commenters. Details of our cost estimates are given in Appendix B of the FEIS.

Comment 2: The sources used by EPA for computing the costs of various type of work, e. g., Dodge (Do78) and Means (Mn77), represent costs for the small commercial and residential market and do not compare favorably to costs incurred with heavy earthworks or industrial construction. (I-10)

Response: The statement is incorrect. The Dodge Guide edition we used for estimating costs is specifically directed towards public works and heavy construction. The Means publication includes costs for heavy construction as well as for commercial and residential construction. The cost estimates we used were for heavy construction. In many cases, unit costs for heavy construction projects should be lower than for light construction because of economies of scale.

Comment 3: EPA assumes a nearby source of suitable clay is available at no cost. In some locations, a suitable clay is either nonexistent or very scarce; if clay is available, it is only at a considerable distance. (I-10, H-18)

Response: In the DEIS we analyzed costs for disposal methods that use clay as a liner material under a pile and as part of a cover over a pile. Contrary to the comment, we included purchasing clay in the analysis (DEIS, Tables B-7 to B-11). Our present analysis (FEIS, Chapter 6 and Appendix B) does not use clay for most alternatives, whether disposal occurs in-place or at a new site. It is sensible to presume that a selection criterion for a new site would be its inherent ability to protect against ground water contamination, so a clay liner would not be needed. We further presume that where in-place disposal could not satisfy a given set of water protection standards, installing a clay liner is not likely to be favored over moving the pile to a better disposal site. We believe our current cost analysis is more realistic in these respects than the one in the DEIS.

Since the role of clay in our cost analysis is now small (see FEIS, Tables B-2 and B-3), the cost of obtaining it is not very significant. Furthermore, special clays are not needed for use as part of a cover; local clay is adequate. We believe it is reasonable and appropriate, in our analysis of average costs under alternative disposal standards, to assume that clay may be bought locally. We recognize that actual costs for various disposal operations may be higher or lower at specific locations than the average costs used in our analysis.

Comment 4: The EPA's cost estimates did not include costs for engineering, field supervision, or contingencies. (I-3, I-10, H-18)

Response: The costs for engineering, field supervision, and contingencies were omitted from the EPA cost estimates in the DEIS, but are included in the FEIS. We increased our remedial action cost estimates by 50% to account for engineering, overhead, profit, and contingencies. Since the remedial actions to be performed do not require the high quality of engineering design and supervision required in other heavy construction (e.g., earth fill dams), we believe that this 50% increase is adequate.

Comment 5: EPA's cost estimates do not include costs of reclaiming the land from which top soil, cover, or rip rap is obtained. (I-10, H-18).

Response: Reclamation of the borrow pits for obtaining top soil, earth cover, clay, and rip rap was not considered in the DEIS, but is included in the revised cost estimates in the FEIS.

Comment 6: EPA's cost estimates do not include costs for cleanup around mill sites, remedial action at offsite locations where tailings were used as fill material, survey and decontamination of used equipment, burial of contaminated equipment, demolition and disposal of buildings, or reclamation of the mill sites. (I-3, I-10, H-18)

Response: The cost analysis in the FEIS covers remedial actions for contaminated structures, mill yards, and other remnants of mill operations. We estimated these costs as being independent of the standards (See FEIS, Table B-4). Costs for cleanup of contaminated land at the mill site and in the vicinity of the mill are discussed in Chapter 7 of the FEIS.

Comment 7: EPA did not perform a cost-benefit or regulatory impact analysis consistent with the requirements of Executive Order 12291. (I-4, I-10, H-18).

Response: Executive Order 12291 was not in effect when the cleanup and disposal standards were proposed, on April 22, 1980 and January 9, 1981, respectively. Under Executive Order 12291, EPA must judge whether a regulation is "major" and, therefore, subject to the requirement of a Regulatory Impact Analysis. That order requires such an analysis if the regulation would result in (1) An annual effect on the economy of $100 million or more; (2) A major increase in costs or prices for consumers, individual industries, Federal, State, or local government agencies or geographic regions; or (3) Significant adverse effects on competition, employment, investment, productivity, innovation, or on the ability of United States-based enterprises to compete with foreign-based enterprises in domestic or export markets.

This regulation is not major, because (1) we expect the total costs of the remedial action program in any calendar year to be less than $100 million; (2) States bear only 10% of these costs; and (3) we anticipate no significant adverse affects on competition, employment, investment, productivity, or innovation.

The costs and benefits of these standards are discussed in the FEIS.

D.4 Disposal Standards

D.4.1 Radon Standard

Comment 1: Radon emissions to the open air are not a significant health hazard, therefore no basis exists for a radon standard. Radon emissions from unstabilized tailings piles do not produce measurable concentrations even at short distances from the pile. At distances greater than one-fourth to one-half mile from the tailings pile, the incremental radon concentrations caused by the pile are only a small fraction of the fluctuation of the natural radon background in the area. (P-19, I-4, I-8, I-9, I-10, F-11, F-14, H-5, H-18)

Response: EPA believes that a limit on radon emissions from tailings piles is necessary for several reasons. The most important is that a radon emission standard implies the need for sufficient earthen cover (or its equivalent) to provide an acceptable assurance of stabilization and isolation of the tailings over a long period of time. This is a major goal of the disposal standards because the greatest hazard from tailings occurs when they are displaced or removed from the piles and placed under or near buildings. Accordingly, the radon emission standard serves the purpose of requiring adequate isolation and stabilization to control both human intrusion and erosion by natural forces.

The radon emissions standard serves also to limit the risk to nearby individuals and the impact of radon on large populations. Our analysis predicts significant harm to people living near tailings piles, and field measurements confirm elevated levels of radon in air close to the piles. We estimate that an individual residing permanently very near an unstablized pile could incur as much as 4 chances in a hundred of a fatal lung cancer. For individuals at greater distances the risks are much smaller, but the total number of people exposed is so large and exposure continues for so long that the collective risk is clearly significant (many thousands of lung cancers over the duration of emissions from all of the piles). The fact that increases in radon levels due to the piles have not been measured more than about 1/2 mile away from a pile does not mean that radon is not present or that there is no increased risk from this radon--it merely means that measurement techniques are not capable of detecting such small increments to a fluctuating background.

Comment 2: The cost-to-benefit ratio has not been adequately considered in setting the radon emission standard. Proper consideration would lead to a much higher standard. (S-7, S-11, S-16, I-3, I-4, I-8, I-9, I-10, F-14, H-10, H-13, H-18)

Response: We have reevaluated the costs and benefits of alternative standards and have revised the radon emission standard upward from 2 to 20 pCi/m^2s. This revised standard will provide more than 96% of benefits expected from the Proposed Standard, but at a substantial cost reduction (see Chapter 6 of FEIS). Under the revised emission limit, the risk to the most exposed individual would be reduced to a few chances in a thousand.

We conclude from our analysis that a still higher radon emission standard, such as 100 pCi/m^2s, would result in significant risks to individuals (up to 1 chance in 100 of lung cancer), a significant impact on populations (20% of the risk from unstabilized piles), inadequate protection against erosion and intrusion, and yet achieve only a small additional reduction in cost.

Comment 3: The radon standard for disposal sites should be a concentration standard, not an emission standard. We recommend standards of 30 pCi/l at 3 feet above the surface of the pile and 3 pCi/l at the boundary of the property. These concentrations would be consistent with NRC's radiation protection standards (10 CFR 20). Such standards would be equivalent to a flux of 100 pCi/m^2s for a stabilized pile and result in a significant cost saving over the EPA proposed standard of 2 pCi/m^2s. (F-14)

Response: The commenter's alternative radon standard of 30 pCi/l is equivalent to the Federal Radiation Protection Guide (RPG) for exposure of workers. Likewise, the commenter's alternative standard of 3.0 pCi/l at the property boundary is equivalent to the RPG for exposure of the general population. These guides are not intended as acceptable radiation levels; rather, exposure in any given situation should be kept "as far below (these) guides as practicable." In this context, the commenter's suggestion implies that it is not generally practicable to attain lower values, but the commenter does not provide any basis for such a conclusion.

The Agency agrees that the proposed disposal standard should be revised to a more cost-effective value and has made appropriate changes (see response to Comment 2, above). Furthermore, we have provided an alternative to the emission standard, in the form of a radon concentration standard at the edge of the tailings pile. Both forms of the final standard provide approximately equivalent health and environmental protection.

Comment 4: The naturally-occurring radon emission rates from soil, with a clearly stated range, should be included in the FEIS. If as stated in the DEIS, 3.0 pCi/m^2s from soil is not unusual, justification for a standard below this value may be difficult. (F-7)

Response: The average radon emission rate from North American soils is probably close to 0.7 pCi/m^2s, but extremes as high as 7 pCi/m^2s have been observed in some regions. If cost-benefit considerations support a standard below the upper range of existing natural levels, we would consider the standard justified in spite of the existence of some higher natural emission rates. However, the radon emission standard has been revised to a more cost-effective value that is clearly above natural levels (See response to Comment 2, above).

Comment 5: NRC licensees must place at least three meters of cover over tailings at the end of milling operations. EPA has not proposed minimum cover requirements for inactive sites. We agree with EPA's approach. The depth of cover should be a site-specific determination. (S-20)

Response: EPA's responsibility under PL 95-604 is to set generally applicable health and environmental protection standards for the remedial action program. DOE has the responsibility to select specific remedial methods to satisfy our standards.

Comment 6: EPA states that "After disposal, the radon emission standard is satisfied if the emission rate is less than or equal to 2 pCi/m^2s plus the emission rate expected from the disposal materials." This wording indicates that radon flux measurements will be required to determine compliance with the standard following reclamation. Flux measurements are unreliable and highly variable and would require lengthy time-averaged measurements. The EPA standard should not require the use of such flux measurements. (S-11)

Response: The statement has been eliminated. A footnote to Section [illegible] of the Final Standard states that "[illegible] the standard applies to design, monitoring after disposal is not required to demonstrate compliance." Pre-disposal emission rate estimates will be needed, however, in order to design a disposal system that will provide reasonable assurance of satisfying the numerical radon emission requirement of the standard. We believe it is adequate to base estimates of pre- and post-remediation long-term emission rates on the radium content of the tailings and [illegible] diffusion theory.

Comment 7: [illegible] in the Federal Register notice ([illegible] FR [illegible]) [illegible] of [illegible]. If the half-value layer (HVL) of radon diffusion through soil is [illegible] cm, then the cover required to reduce radon emission by [illegible] percent is [illegible] cm, not [illegible] cm as the footnote indicates. ([illegible])

Response: We agree, and have made the appropriate corrections in our calculations.

Comment 8: EPA should clarify that the radon emission standard is in addition to the radon emissions from cover materials. Furthermore, the reference to "disposal materials" in the note is confusing and should be changed to "cover materials." (S-20, F-13)

Response: These issues are clarified in the Final Standard (see footnote to Section 192.02).

Comment 9: The disposal standard is inconsistent with the cleanup standard for open lands with regard to radon emissions into air. (1-1, F-11, H-1)

Response: These standards address different problems. The cleanup standard for land addresses exposure of people directly to gamma radiation and release of radon gas into future buildings on the land. The disposal standard limits radon emissions from tailings piles to the open air and provides for stabilization and isolation of the tailings. Therefore, there is no need for comparability between the radon emission standard (disposal standard) and the estimated radon emissions from contaminated land under the cleanup standard. We developed them independently by considering the health benefits and costs of a range of alternative standards for each class of circumstances.

[illegible] Water Standards

Comment 1: Specific ground water standards are not required for inactive sites because it is unlikely that significant [illegible] in the arid climates in which most sites are located. The sites are unlikely to cause any significant or hazardous contamination of drinking water supplies. Such problems as do arise may be addressed on a case-by-case basis by DOE. [illegible]

Response: Adequate assessments have not been performed, but available information suggests that most inactive sites pose little threat to ground water, so that numerical standards may not be needed to provide health protection. Furthermore, inflexible standards could force large expenditures at a few sites, while providing only marginal improvement in health and environmental protection. At least one site is in a wet climate, however, and tailings at several sites are in contact with the water table. In view of this, we agree that any ground water problems that may become apparent at a few sites as the assessments are performed should be dealt with in consideration of pertinent site-specific circumstances. [illegible]

Comment 2: EPA should not apply "drinking water standards" to underground water that may not be used for drinking. Such standards are too stringent for protection of underground aquifers. Drinking water standards should be applied only where water is actually used or may reasonably be expected to be used for drinking. (I-4, I-10, H-9, H-18)

Response: The basic requirement of the Proposed Standard for ground water is that underground water of any quality not be degraded by releases of specified substances from tailings. We used the concentration limits of the National Interim Primary Drinking Water Regulations (not the NIPDWR themselves) only to define a category of water that needn't be thus protected: that is, water that was already within the concentration limits of the NIPDWR could be degraded up to those limits under the Proposed Standards. Without use of such concentration limits nondegradation would have applied to all ground water.

Comment 3: Non-degradation of water quality should be required: (a) in areas where water is scarce (P-11); (b) even for water whose existing quality is below the limits in Table A of the Proposed Standard (P-22); (c) when natural background levels exceed the limits in Table A of the Proposed Standard. (S-[illegible])

Non-degradation as proposed is excessive because it ignores the purpose for which the water will be used. Water should be protected only to levels consistent with existing and future uses. (I-[illegible], I-[illegible], I-10, I-11)

Response: We believe these comments have merit, even though some may appear contradictory. [illegible]

Comment 4: Non-degradation or no releases are probably not attainable because: (a) the tailings would have to be completely [illegible]

Response: [illegible]

long-term standards. We don't think the particular techniques referred to in the comment generally would be needed to satisfy the Proposed Standards. However, the Proposed Standard might, in some cases, bring about very expensive disposal methods, even where no definite threat to water quality had been established. (b) We don't understand how the practicality of limiting pollution from future contaminant releases from the tailings is affected by past releases. Existing contamination, however, certainly would complicate future monitoring efforts to determine whether any remedial actions taken to control releases had been effective.

Comment 5: The standards should apply at 0.1 km for either new or existing sites. This will make it more difficult for a poor site to be accepted for final disposal. Contamination from a pile could travel through ground water and enter surface water within 1km of the pile. (S-14, S-18, H-7)

It is inadvisable to set a single distance for all existing sites because of variations in conditions among the sites. A single distance of application seems more justified for new disposal sites. (F-8)

Response: Although adequate studies have not been made, there is little evidence of ground water contamination near the inactive mill [illegible] will continue to study these sites as [illegible] we expect that few sites will be found [illegible] erm pollution sources. Since complete [illegible] hose few sites may require moving the [illegible] e and expensive procedure, we believe [illegible] ould be decided taking account of local [illegible] m these comments, any fixed distance [illegible] andards at existing sites can sometimes [illegible] ed to apply such standards 1.0 km from [illegible] flexibility. Because we have now [illegible] ion standards, however, the issue of [illegible] er needs to be addressed.

Comment 6: Applying the standards at arbitrary points is unreasonable. Underground water can cause harm only at the place it is used. The proposed standards could cause large expenditures for no health benefits. (I-8, I-10)

Response: [illegible] iot to set water protection standards [illegible] that such standards could bring about [illegible] e benefit. Protecting future water [illegible] t of avoiding pollution of potentially [illegible] ven those that are not currently being

Comment 7: The proposed language for the surface water standard is vague, arbitrary, and capricious. One cannot determine what EPA means by "harmful". Furthermore, the Proposed Standard does not take account of the character of the receiving water and applies even to intermittent streams that are not used as significant sources of drinking water. The standards would also apply to hypothetical future uses, which are totally speculative. (I-8)

Response: We agree that the term "harmful", used without further qualification or definition, is too vague. We note, however, that the proposed surface water standard would protect waters of all quality, not just those used for human drinking water. Livestock and wildlife use even intermittent streams in regions where surface water is scarce. The basic issue of whether the Proposed Standard is too broad, however, has been made moot by our decision not to address water protection directly in the final standards.

Comment 8: EPA's definition of an "underground source of drinking water" is contrary to common sense. The definition includes sources with up to 10,000 mg/l of total dissolved solids (TDS) whereas water containing even 1,000 mg/l TDS is considered brackish. Moreover, EPA has not provided for exempting certain aquifers as it does in its regulations for underground injection controls. (I-3, I-4, I-8)

Response: The Proposed Standards would protect underground water sources whose use is not currently economic because extensive treatment would be needed. We stated in the DEIS our belief that EPA's general policy to protect such sources reflected Congressional intentions. The commenters are correct in noting that the Agency has found exemptions to this policy justified under certain circumstances. However, the issue of whether to allow these same or other exemptions for tailings disposal is now moot, because the final standards do not specify water protection requirements.

Comment 9: The definitions of "underground source of drinking water" is too broad and unreasonable because it does not consider whether the water is actually used by a significant population, or whether it might be cheaper to provide the users with alternative water supplies. EPA has also not considered State laws that may restrict use of a water source. (I-8)

Response: The Proposed Standards would apply over at least 1000 years. Current use of a given water source is not a good indicator of the extent it might be used over such a lengthy period in the future. It is prudent to assume water sources might be used over such a period and to provide alternative water sources to current users, but it is not reasonable to expect that the needs of users over the next 1000 years could be adequately satisfied in that manner. Considering the time over which the Proposed Standard would apply, therefore, it was appropriate not to consider the factors addressed in the comment. Under the Final Standards, however, the implementing agencies will determine water protection requirements site-specifically, taking account of any factors they determine to be pertinent.

Comment 10: Normal background levels of some substances already exceed the concentration levels given in the Proposed Standards. This could require extensive exemptions. (S-18, H-7)

Response: As we indicated above (see Comment 2), the Proposed Standard would require that water exceeding specified concentration levels not be degraded by substances released from tailings. With high background concentrations, this requirement should be relatively easy to satisfy. The final standards allow the implementers the flexibility to decide water protection requirements site-specifically, taking account of all pertinent local factors.

Comment 11: An extensive sampling program could be required to establish background levels and to determine concentrations present after disposal. (F-14)

Response: We believe that pre-disposal analysis is needed to establish whether water pollution has already occurred and the potential for future pollution. Such information is needed for designing adequate disposal systems. Available information suggests that few inactive sites may pose serious long-term threats to water quality, but more definitive studies are needed. After proper disposal, however, the need to monitor water should be minimal.

Comment 12: The available means for minimizing the contamination that reaches the environment are woefully inadequate. (P-8)

Response: We believe that favorable site conditions combined, if necessary, with simple engineered barriers can control health and environmental effects from tailings for long periods of time (see Chapter 5 of the FEIS). Under very unfavorable site conditions, however, such as wet climate or susceptability to severe floods, more sophisticated barriers may be needed, or the pile may have to be moved to a more favorable disposal site.

Comment 13: EPA should set remedial action standards for water that has been contaminated by releases from tailings piles before disposal. (P-20) The DEIS does not substantiate the impracticality of cleanup standards for existing ground water contamination. (P-17) Existing pollution should be cleaned up to the maximum extent practicable. (P-22)

Response: Our decision not to propose such standards is consistent with our overall approach in the Final Standards of allowing the implementers to determine water protection requirements for each site where protective measures may be needed. As discussed in the FEIS (Chapter 8), we expect the implementers to consider the need for and practicality of controlling contaminants that have already been released, and to apply remedies that are found justified. Little, if any, such pollution has been found, to date, but the searches for it have not been completed.

Chapter 5 of the FEIS refers to case studies and analyses of ground water pollution from uranium mills and other pollution sources. Each case presents its own unique circumstances. Various remedial actions for ground water pollution from these sites have been discussed, and, in a few cases, applied. Such remedial actions may vary considerably in cost and effectiveness. We believe setting uniform remedial action requirements for inactive uranium mill sites is not feasible, because we don't know whether such standards could be satisfied, nor what the cost might be. We have concluded that such remedial action decisions should be made by the implementers on a case-by-case basis. This is equivalent to a "standard" that requries remedial actions to attain residual contamination levels that are "as low as reasonably achievable", because the implementers will determine a practical end-result. We would not agree with the last comment above, however, if the suggestion is to clean up existing pollution to the maximum extent that can be accomplished, regardless of the cost.

Comment 14: EPA's review (DEIS, Appendix C) of the toxicities of nonradioactive substances found in tailings is deficient. Higher concentration values than those in Table A of the Proposed Standard would adequately protect people. (I-4, I-5, I-8, I-10, H-19)

Response: We have reconsidered available data on the toxicity of these substances, including information provided by commenters. Appendix C of the FEIS reflects this reconsideration; additional responses to the scientific content of the comments are given below. For reasons we describe elsewhere (FEIS, Chapter 8 and Appendix A), however, the Final Standards do not contain explicit water protection requirements. The implementing agencies will instead determine any necessary water protection requirements site-specifically. Therefore, the issues raised by commenters regarding our judgements in proposing specific values for Table A are now moot.

We note, however, that the methods by which long-term water protection requirements for tailings disposal are implemented are only semi-quantitative. They involve long-term projections based on hydrogeochemical models and are inevitably imprecise. Therefore, the exact contents of protection requirements for this remedial action program are not critical; the values in Table A could have been several times higher or lower without a significant change in projected health protection. The values would be much more critical, however, for standards determining the quality of public water supplies. Public drinking water supplies serve millions of people, and the quality of their water may readily be precisely measured.

Comment 15: Ground water protection standards are needed for uranium and thorium, because their high expected mobility in ground water can make them hazardous (P-2), and for thorium-230, lead-210, and vanadium, because their high mobility makes them good indicators of pollution. (S-14)

Response: Table A of the Proposed Standards covered uranium explicitly and addressed thorium implicitly by stating a concentration level for alpha radioactivity. We selected the substances listed in Table A based on their abundance in tailings, toxicity, and mobility under most conditions. The proposed list would also protect against many other substances whose environmental chemistry is similar to that of listed substances. We believe any benefits of extending the list would be marginal. Under the Final Standards, however, the implementing agencies will determine water protection requirements site-specifically. We would have no objection if they addressed substances we had not listed in the Proposed Standard, especially if local circumstances indicated a need to do so.

Comment 16: Based on long-term epidemological studies and on recent recommendations by the International Commission on Radiation Protection (ICRP), raising the EPA drinking water standard for radium-226 and radium-228 to at least 30pCi/l can be shown to have a safety factor of at least 1,000 to 10,000 with respect to the internationally accepted maximum permissible body burden standard for radium of 0.1 microcuries. (P-19)

Response: The basic issues raised by the commenter were considered when EPA established the National Interim Primary Drinking Water Regulations (NIPDWR) (EPA76). We note, however, that the maximum permissible body burden referred to above is an upper limit for healthy adult radiation workers. The risk associated with that limit is higher for some people than for others, and smaller body burdens are clearly desirable. We believe radioactivity standards for drinking water supplied to the general public should be determined by independent consideration of the costs and benefits of improving supplies, and not by applying an arbitrary safety factor to the upper limits established for occupational radiation protection. With respect to the Proposed Standards for disposal of uranium mill tailings, however, the issue raised by the commenter is moot, because the Final Standards do not specify concentrations of radioactivity in water.

Comment 17: The Proposed Standard for uranium in water is arbitrary and has no sound scientific basis. Other standard-setting or advisory bodies, such as the Nuclear Regulatory Commission, the International Commission on Radiological Protection, and the States of New Mexico and Wyoming, have much higher limits. (I-4, I-5, I-10, S-20, H-16)

Response: We review the toxicity of uranium in Appendix G of the EIS. Uranium is chemically toxic to the kidneys and radiotoxic to the bones. The radiation effect of uranium ingestion, which is primarily bone cancer, may pose a greater health hazard than the chemical effects, but existing standards for uranium in water are based on its chemical toxicity. (The considerations discussed in the first paragraph of the response to Comment 3 in Section D.4.1 apply here as well, however.)

Our proposed disposal standards used numerical values taken from standards for drinking water (but in a different context--see response to Comment 2, above). Ingested radium also irradiates bone, and a limit for radium in drinking water has been established. Therefore, we proposed a disposal standard for uranium in water that would give an estimated dose to bone comparable to the dose from ingesting radium at the drinking water concentration limit. We recognize that this is not a fully satisfactory method for setting disposal standards.

For reasons we present in Chapter 8 and Appendix A of the FEIS, we have decided that the disadvantages of setting numerical water protection requirements for disposal of tailings from inactive mills outweigh the advantages. The final standards, therefore, allow the implementing agencies to determine water protection requirements site-specifically, guided by State and Federal Water Quality Criteria for anticipated or existing uses of water (see 40 CFR 192.20(a)).

Comment 18: Short-term variations in uranium concentrations in ground water occur naturally. It would be unreasonable to assume that small concentration increases were necessarily caused by a nearby tailings pile. If EPA issues a ground water standard for uranium, it should take account of natural ground water variability. (I-5)

Response: EPA's proposed and final standards apply only to residual radioactive materials (i.e., tailings), not to substances that are present naturally. EPA has emphasized the need for reasonable implementation of these standards. Under the final standards, the implementing agencies will determine water protection requirements site-specifically. We agree that natural concentration variations should be considered in assessing whether tailings piles are affecting neighboring ground water.

Comment 19: The National Academy of Sciences (NAS), in EPA publication [illegible], March [illegible], recommends [illegible] mg/liter as the maximum contaminant level (MCL) of arsenic in drinking water. The DEIS recommendation of 0.05 mg/liter is too restrictive, and pentavalent arsenic is harmless and should be excluded from the calculation. (I-8)

Response: The first part of the comment is correct--for 1973. In the review of arsenic toxicity in the National Interim Primary Drinking Water Regulations (EPA76), EPA concluded that the MCL for arsenic in drinking water should be 0.05 mg/liter, but did not comment on trivalent vs. pentavalent forms. The 1977 NAS review (NAS77) concluded that "if the time factors for the development of (skin) cancer are shown to be reasonable, then the current interim standard (for arsenic) of 50 ug/liter may not provide an adequate margin of safety." The NAS stated that pentavalent forms are more readily absorbed than trivalent forms, but trivalent forms are more toxic than pentavalent--perhaps 8 to 10 times more toxic. However, in comparable studies in rats, sodium arsenite (trivalent) was only twice as toxic as sodium arsenate (pentavalent) (Ve78).

Given the uncertainty in the valence and chemical form of arsenic in water and in concentrations at which human health effects can be observed, a maximum contaminant level of 0.05 mg/liter for arsenic in drinking water does not appear too restrictive. With reference to disposal standards for uranium mill tailings, however, the issue is moot, because our Final Standards do not specify concentrations of toxic substances in water.

Comment 29: Since fatal toxicity occurs after consumption of 550 to 600 milligrams of barium chloride, even consumption of 100 liters a day of water containing 1 mg/liter of barium would be less than the minimum toxic amount. Even if people consumed two liters of water containing 5 mg of barium per liter, there would be a very large safety factor. (I-8)

Response: The comment is correct as far as it goes. While a single oral dose of 550 to 600 milligrams of barium as barium choride would rapidly cause death, consumption of 1 mg of barium per liter in drinking water would not. Rapid death is not the only condition health protection standards should address, however. Consumption of barium at low concentrations may cause chronic toxicity disease.

Death rates from cardiovascular disease in communities whose drinking water contains 2.0 to 10.0 mg of barium per liter have been compared with those whose drinking water contains 0 to 0.2 mg of barium per liter (Br79). Communities with the higher barium concentrations in drinking water had significantly higher death rates for arteriosclerosis and for all causes of death. The authors point out that confounding factors exist and any inferences on the health effect of barium should be drawn with caution. If the observations can be confirmed, a concentration of 2.0 mg/liter in drinking water may be too high. With reference to disposal standards for uranium mill tailings, however, the issue is moot, because our Final Standards do not specify concentrations of toxic substances in water.

Comment 21: The Proposed Standard for chromium, 0.05 mg per liter, is too restrictive. The DEIS acknowledges that lifetime exposure of laboratory animals to less than 5 mg/l in drinking water caused no reported effects. There is a case in which a family on Long Island used ground water containing 20 times the Proposed Standard for several years without apparent ill effects. (I-8)

Response: The commenter's source for the last statement is an anecdotal report by Dr. Victor Zelma (NM76). Dr. Zelma also stated: "However, the family refused to submit to physical examination and laboratory workup." Therefore, we do not consider this report an adequate basis for setting health protection standards. Our Final Standards for disposal of tailings piles do not specify concentrations of toxic substances in water, however, so the issue is moot in this context.

Comment 22: The Proposed Standards set maximum concentrations for only six of the ten toxic substances. Maximum concentrations are not set for nickel, beryllium, vanadium and zinc even though the Council on Environmental Quality has identified nickel, beryllium, zinc oxide and zinc chloride as possible carcinogens and vanadium as an acute respiratory irritant. (P-17)

Response: Appendix C of the EIS has been expanded and now discusses the toxicity of nickel and vanadium. No attempt is made in the FEIS to discuss possible carcinogenesis for nonradioactive elements, particularly for elements or compounds identified as hazardous in occupational inhalation exposure or by atmospheric exposure pathways (see discussion of hazardous compounds from coal technology, p. 208-209 in Environmental Quality (CEQ76)). Data on elements causing cancer following ingestion is sparse and there are not enough data to develop dose-response curves.

Comment 23: The proposed molybdenum concentration of 0.05 mg/liter is arbitrary and unsupported. The apparent toxicity of molybdenum is low. (I-4) There is no scientific data to show that 0.05 mg/liter of molybdenum is injurious to humans. (I-5, I-8, I-10) The proposed molybdenum level is lower than necessary, misinterpreting the reference used. It is unnecessary to specify a level for molybdenum. If a level is set, both toxicity and deficiency conditions should be considered. (R-17, R-28)

Response: We consider the basic policy issue raised by these comments—that the Proposed Standard for molybdenum was too low—to be moot, because the Final Standard does not specify concentrations of toxic substances in water. Nevertheless, we agree that the DEIS gave insufficient attention to molybdenum deficiency, and have corrected this in Appendix C of the FEIS. However, there are data that strongly suggest that ingestion of excess molybdenum is toxic.

In regard to deficiency: The National Academy of Sciences estimated that the "Adequate and Safe Intake" of molybdenum ranges from 0.03 to 0.06 mg/day in infants to 0.15 to 0.50 mg/day in adults (NAS80c). The estimated daily intake of molybdenum in adults in the U.S. is 0.335 mg/day (range 0.21 to 0.46 mg/day) (Sc70). Children might have a daily intake one half as great as adults (NAS80b). It appears unlikely that molybdenum deficiency would occur in persons eating a regular diet even if there were no molybdenum in their drinking water.

The National Academy did not review recent reports associating molybdenum deficiency with increased incidence of esophageal cancer (Lub80a, Lub80b), although the association had been noted earlier Bub66). Perhaps resolution of the molybdenum esophageal cancer relationship will allow more accurate description of the range of required intake of molybdenum.

In regard to toxicity: Although a definite cause-effect relationship has not been established, a bone-crippling disease has been observed in India in areas where sorghum contains high concentrations of molybdenum (FDA75). Arthralgia has been reported in copper-molybdenum plant workers in Russia (Fra75).

Reports of similar clinical complaints from an area of Armenia where soil concentrations of molybdenum and copper are high have provided some quantitative data. Symptoms of a gout-like condition with arthralgia and joint deformities were reported in villages where 10-15 mg of molybdenum was consumed per day. Symptoms occurred among 31% of adults in one village, and 18% in another. In a control area where molybdenum intake was 1 to 2 mg/day the incidence of symptoms was 1% to 4% (Ko61, Yab64). There is a known nutritional interaction between molybdenum and copper, and the molybdenum-copper ratio was 2 to 1 in the high molybdenum area and 1 to 7 in the control area. Therefore, the findings of these studies are not definitive. Perhaps the incidence of symptoms would be lower in the high molybdenum area if the copper in the diet were higher, or the incidence higher in the "control" area if there were less copper in the diet.

Comment 24: The Proposed Standard for selenium is too low, is arbitrary and capricious and not based on health considerations. There is no evidence that selenium is harmful at levels much higher than 0.01 mg/l. (I-8) The genesis of the proposed concentration level evidently had its basis in fears that selenium was carcinogenic, but it is really anti-carcinogenic and is essential to human and animal nutrition. The daily intake at the proposed limit is 1/35 of the amount EPA claims is toxic. One U. S. case report and some Chinese studies indicate cardiomyopathy (Keshan disease) is associated with selenium deficiency at an intake of 0.01 mg of selenium per day. Chinese researchers reported no harmful side-effects after supplemental selenium was given to a large group for three to four years. (I-4)

Response: We consider the basic policy issue raised by these comments--that the Proposed Standard for selenium is too low--to be moot, because the Final Standard does not specify concentrations of toxic substances in water. However, we believe the specific toxicity issues the commenters cited have not been resolved by the scientific community as conclusively as they suggested.

Consideration of carcinogenesis may have been important in setting maximum contaminant levels for selenium in drinking water in 1962, as referenced by Comment I-8. If so, there has been no continued association of the limit with carcinogenesis, and the essential contribution of selenium to nutrition has been recognized in connection with water quality standards (NAS72b, EPA76, NAS80b).

The minimum dietary requirement for selenium may be only 0.02 mg/day (St78). The estimated daily intake of selenium in food is from 0.132 mg/day to 0.216 mg/day (NAS80b). If the minimum level of selenium causing chronic toxicity is 0.7 mg/day (EPA76), the minimum safety factor relative to food alone is about 3.5. If one accepts the National Academy of Science's rationale that a safety factor of 10 is needed to allow for variations in human response (NAS77), then the level of selenium provided in food alone may be toxic to some individuals. The concentration of selenium in water should then be as low as practicable.

Excessive supplementation of the diet with selenium may not be safe. A recent report noted two infants with cystic fibrosis whose clinical condition deteriorated (one died) after they were put on a relatively low intake of selenium-yeast supplement (Sn81). While selenium is not shown to be the only cause of the deterioration, the authors suggest careful consideration of selenium supplementation. Furthermore, two clusters of amyotrophic lateral sclerosis have been reported in a high-selenium region in the United States (Ki77, Da78). While these case reports suffer many of the same deficiencies as the human epidemiology studies noted below, they and other data strongly suggest that relatively high intakes of selenium are not hazard free.

One comment suggested that higher intakes of selenium are advantageous because of its anti-carcinogenic properties. Lo and Sandi (Lo80) reviewed the reference on animal studies cited by the comment, plus about 18 more. They concluded that earlier reports of selenium induction of cancer in animals are apparently unfounded, and that while there is some evidence selenium may have anti-carcinogenic properties in rats, further confirmation and statistical evaluation are needed.

Lo and Sandi also reviewed the references on human epidemiology cited by the comment, plus 8 more. They point out that there is an inverse correlation in 27 countries between selenium intake and mortality rates for leukemia and cancers of the breast, large intestine, rectum, gastrointestinal tract, prostate, ovary, and lung. However, there are similar inverse correlations of pancreatic and lung cancer mortality with manganese and arsenic intake, and direct correlation for a number of common cancers with intake of selenium antagonists such as zinc, cadmium, and copper. In a recent report, Burton, et al. studied cancer and drinking water in 100 U. S. cities and concluded that the mortality rates for a variety of cancers decrease by up to 10% as the silica concentration in water increases from 0 to 15 ppm (Buc80). The major deficiencies of such geographic epidemiology studies are that they often combine outdated and new survey data, and they seldom have data on all elements, particularly those known to interact nutritionally with selenium (Sh80). Based on all the evidence, selenium is probably important in carcinogenesis, either directly or indirectly, but not enough is known to justify selenium supplementation of U. S. diets at this time.

The issue of Keshan disease (congestive cardiomyopathy) and selenium deficiency may not be germane. Chinese investigators have reported that daily selenium intake in areas not affected by Keshan disease was "only about 30 micrograms"—well below average U. S. intakes. They also concluded that, because of seasonal, urban-rural, and other discrepancies, "while selenium deficiency plays an important role in Keshan disease it does not explain all the epidemiologic characteristics of this disease" (KD79a), and "in our opinion, Se deficiency is not the only cause of Keshan disease" (KD79b). The treatment the Chinese used to prevent Keshan disease brings average daily intake into or slightly above the normal average intake range in the United States.

D.4.3 Period of Application of Standards (Longevity)

Comment 1: The requirement that the disposal standard be met for at least 1000 years is unreasonable. Experience shows it is difficult to predict the future for more than a hundred years. A period of 100-200 years is more than an adequate time period. (P-19, I-3, I-4, I-8, I-10, H-13, H-18)

Response: We consider effective long-term stabilization and isolation of tailings piles an important goal of disposal because the tailings will remain hazardous for hundreds of thousands of years. It is difficult to predict the future, but more so for human societies and their institutions than on the physical effects of geological processes. Uncertainties about the future do not preclude designing disposal systems, based on analysis of the potential effects of natural processes over time, that we are reasonably certain will remain effective for long periods. In keeping with this remedial action program, we believe it is practical in most cases to provide such protection for 1,000 years, but at least for 200 years.

Comment [illegible]

Response: It is not possible to prove that a given disposal system will satisfy disposal standards that apply over a long future time interval. Rather, we can provide a degree of assurance that depends on the thoroughness of pre-disposal site characterization studies and the ability of the disposal system to resist the disruptive and dispersive processes that [illegible]

[illegible] are required to provide reasonable assurance. We are confident that the implementation process Congress established, wherein DOE selects and performs remedial action, with NRC's concurrence and the full participation of the affected State, is adequate and appropriate for making the required determinations.

Post-disposal monitoring and evaluation are no substitute for standards that state the objectives of disposal systems. As we indicated above, disposal system design should be based on analyses of the physical properties of disposal sites and the effects of natural processes over time. Monitoring and evaluation are useful for determining post-disposal performance of the disposal systems, but are not [illegible]

[illegible]

Response: We have not assumed that institutions would fail in [illegible] years. [illegible] we have concluded that it is neither reasonable nor necessary to rely on institutions for long-term care of radioactive waste. Passive control methods are preferable because their performance can be more accurately [illegible]

Comment [illegible]

Response: We selected 1,000 years as the upper range of the time period for which there is reasonable assurance that controls will remain effective. In our view, the uncertainties in the effectiveness of controls increase significantly in the 1,000 to 10,000 year period.

This uncertainty can be illustrated with a simple assessment of average erosion rates. Erosion rates for the Colorado River Basin are reported to be between [illegible] and 25 centimeters per 1,000 years based on measurements of the amount of material carried by the river (Bo71, Ha75, Sc73). These erosion rates would not impair the effectiveness of a 3-meter earthen cover in a 1,000-year period. However, in 10,000 years, 2.5 meters of the cover could be eroded away if the high end of the range is attained. In contrast, if only the low end of the range [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible] selected [illegible] removal of most buried tailings are [illegible] addition, we considered the difficulty of measuring various levels of surface contamination, and of identifying and measuring buried tailings. Detecting low concentrations of buried tailings could be difficult and nonproductive. As opposed to surface contamination, which is often windblown and mixed with surface soil, buried tailings are not expected to occur often in low concentrations, and are less hazardous when they do. Based on this analysis, we have revised the standard for surface contamination of soil from 5 pCi/g in the top [illegible] cm of soil to 5 pCi/g averaged over the top 15 cm of soil, and the

standard for subsurface cont[illegible]
over 15 cm layers of soil. [illegible]nation from 5 pCi/g to 15 pCi/g averaged
essentially the same health [illegible] believe these standards will result in
implement. [illegible]otection, but will be much simpler to

[illegible]ise the proposed open lands cleanup
[illegible]-226 in any 5 cm thickness of soil within
[illegible]y 15 cm thickness below 1 foot to a more
[illegible]econsider the practicability of adopting
[illegible]asuring radium-226 at the levels (and in
[illegible]he proposed standard and distinguishing
[illegible]at these levels from natural background
[illegible] Many samples will have to be collected
[illegible] with the standards. (S-1, S-5, S-15,
[illegible]18)

[illegible]or cleanup of land has been changed in a
[illegible]fy determination of compliance (see the
[illegible] We were aware that detecting radium-226
[illegible]ight present some measurement difficul-
[illegible]t the standard could be implemented
[illegible]easonable assurance" that the numerical
[illegible]ccuracy of available field and
[illegible]ed with reasonable survey and sampling
[illegible]d this problem and conclude that the
[illegible] to simplify the measurement problems
[illegible] protection. The Final Standard also
[illegible]id unnecessarily stringent verification
[illegible] (Subpart C, Section 192.20).

[illegible]ify the meaning of "any 5 or 15 cm"
[illegible] proposed open land cleanup standard.
[illegible]rally would lead to the conclusion that
[illegible]uld need to be analyzed to demonstrate
[illegible] P-3, F-10, F-14, H-1)

[illegible]ndard would require only "reasonable
[illegible]mits were satisfied. Such a literal
[illegible] unwarranted, because it would lead to
[illegible]easonable implementation. The word
[illegible]standard, however, and we have provided
[illegible]nce. Nevertheless, the implementing
[illegible]elop and apply detailed procedures that
[illegible] that the numerical standards are
[illegible]

[illegible]ify the fact that the proposed open
[illegible]g of radium-226 is a concentration
[illegible]

Response: The standard for cleanup of land applies to residual radioactive material from a uranium processing site. The Final Standard makes clear that its numerical requirements refer to an excess above the background level.

Comment 5: EPA should define the term "average" as used in the proposed open land cleanup standard of 5 pCi/g of radium-226 and also define the area over which the average applies. (P-4, P-5)

Response: The Final Standard for land cleanup (40 CFR 192.12(a)) is clear in applying to averages over specified thicknesses of soil. However, 40 CFR 192.20(b) (Guidance for Implementation) says, in effect, that compliance with the standard should be demonstrated by radiation surveys involving additional averaging over limited areas. Therefore, area averages may be taken in providing reasonable assurance that the standard for the average radium-226 concentration in specified thicknesses is satisfied. However, we believe the implementing agencies should determine the detailed procedures that provide reasonable assurance for the diverse conditions that occur in this remedial action program.

Comment 6: EPA should define how deep below the surface the open land cleanup standard of 5 pCi/gm of radium-226 applies (i.e., 5, 20, 100 ft.). (P-19)

Response: We do not believe it is necessary or wise to define the depth below the surface to which the land cleanup standard applies. The standard permits the implementing agencies to make decisions on a site-by-site basis. Most subsurface residual radioactive materials will usually be in the top few feet of soil. For exceptional cases where residual radioactive materials are present at greater depths, the need for removal of these materials can be determined on a case by case basis using the criteria for applying supplemental standards.

Comment 7: EPA should make the open land cleanup standard more flexible to allow for decisions based on site-specific considerations, including options for land reclamation rather than soil removal. (P-9, S-5, H-9, H-15, H-18)

Response: The standard for cleanup of land has been revised in a number of ways that provide additional flexibility in implementation. In particular, the land cleanup standard (40 CFR 192.12(a)) need not be applied when its application would "notwithstanding reasonable measures to limit damage, directly produce environmental harm that is clearly excessive compared to the health benefits to persons living on or near the site, now or in the future" (40 CFR 192.21(b), or when "the estimated cost (would be) unreasonably high relative to the long-term benefits, and the (tailings) do not pose a clear present or future hazard" (40 CFR 192.21(c)). Where either of these criteria is satisfied, remedial actions need only come as close to meeting the standard for land cleanup as is reasonable under the specific circumstances (40 CFR 192.22). Reclamation may sometimes be justifiable under these criteria as an alternative to fully satisfying the land cleanup standards.

Comment 8: EPA should establish less stringent standards for cleanup of open lands for difficult-to-clean areas, such as steep hills, river banks, bluffs, etc. The proposed standards are not cost effective when the risk to workers attempting to cleanup these difficult areas are considered in relation to the reduction in future potential risks to the public. (F-10)

Response: See response to Comment 7, above. In addition, according to 40 CFR 192.21(a), supplemental standards (40 CFR 192.22) may be applied whenever public health or safety would be unavoidably endangered by attempting to satisfy any of the provisions of Subparts A and B of 40 CFR 192.

Comment 9: EPA should consider a gamma dose-rate standard as an alternative to the proposed open land cleanup standards of 5 pCi/g of radium-226. (H-18)

Response: We considered limiting the surface gamma radiation level, but concluded that this type of standard would be harder to apply to subsurface material (see Chapter 8 of the FEIS). However, the Agency expects gamma radiation survey instruments to be used in demonstrating compliance with the standards (see 40 CFR 192.20(b)).

Comment 10: EPA has not justified or demonstrated a need for the open land cleanup standard of 5 pCi/g of radium-226. EPA based this standard on the consideration that soil concentrations in excess of 5 pCi/g of radium-226 will result in radon decay product concentration in houses in excess of 0.01 WL. Because of the uncertainty between radium-226 in soil concentrations and indoor radon decay product concentrations, this is not an adequate basis on which to set a standard. Our calculations show that a radium-226 concentration of 30 pCi/g would result in an indoor radon decay product concentration of 0.02 WL. Therefore, the EPA standard of 5 pCi/g is too low and if a radium-226 in soil standard is to be used it should be no less than 30 pCi/g. (1-3, 1-10, H-13, H-18)

Response: The purpose of the land cleanup standards is to limit the risk from inhalation of radon decay products in houses built on land contaminated with tailings, and to limit gamma radiation exposure of people using contaminated land. We estimate that each increase of 0.01 WL inside a house increases the risk of lung cancer to each of its inhabitants by something like 0.5 to 1%, for an assumed lifetime of residency. The infiltration of radon in soil gas directly into a house is by far the largest contributor to indoor radon. Because the health risks from soils contaminated with radium-226 are potentially so great, we want to set the land cleanup standard as close to background as is reasonable, taking into consideration the difficulties in measuring the residues and distinguishing them from natural background.

We agree with the commenters that the relationship between indoor radon decay product concentrations and radium-226 concentrations in soil is highly variable and dependent on many factors. We also agree that houses built on land containing 5 pCi/g of radium-226 will show a wide range of indoor radon decay product concentrations. However, for average conditions, we estimate that 5 pCi/g of radium-226 in soil can readily lead to an indoor radon decay product concentration of 0.02 WL. This estimate is supported by field data for houses on uncontaminated land. Table 3.7 of the FEIS shows that normal indoor radon decay product concentrations occur over a broad range, with medians from 0.004 WL to 0.009 WL in studies for several areas of the United States. Since radium-226 concentrations in normal soils average less than 1 pCi/g, we expect soils containing 5 pCi/g to readily produce indoor radon decay product levels above 0.02 WL, unless the higher concentration material is present in only a thin layer.

The commenters presented calculations, not data, to show that 30 pCi/g of radium-226 is required to cause an indoor radon decay product concentration of 0.02 WL. These calculations are based on the use of a flux reduction factor of 0.2 for radon entering the structure, and an air exchange rate of 1.5 changes per hour. We believe, for most cases, that the use of these factors significantly underestimates the indoor radon decay product concentration. The normal air exchange rate in residences is about 1.0 change per hour. Furthermore, the use of a radon flux reduction factor is incorrect, based on actual field experience. While concrete slabs are theoretically effective barriers for radon, numerous field observations have revealed that most radon enters structures through cracks and other openings in a slab or floor. Also, recent data by Nazaroff (NA81) indicates that the amount of radon entering a house is greater than the radon flux at the soil-air interface. That is, the presence of a house increases the radon flux from the soil. The use of a flux reduction factor, therefore, results in an incorrect estimate of the amount of radon entering a house.

D.5.2 Indoor Radon Decay Product and Gamma Radiation Standards

Comment 1: The proposed indoor radon decay product standard of 0.015 WL is not cost-effective. EPA should set a higher standard, supported by a cost-benefit analysis, which can be practically implemented. (P-19, S-18, I-4, F-10, H-18)

Response: We have reevaluated the costs and benefits of alternative indoor radon decay product standards (see Chapter 7, FEIS), and changed the standard to facilitate implementation and more closely conform to other related standards. Under the Final Standard, the objective of remedial actions is to achieve an indoor radon decay product concentration of 0.02 WL. For circumstances where remedial action has been performed and it would be unreasonably difficult and costly to reduce the level below 0.03 WL, the remedial action may be terminated at this level without a specific finding of the need for an exception. Furthermore, we have provided additional flexibility to avoid excessive costs by [illegible] remedial measures [illegible] 0.02 WL [illegible] slightly exceeded.

Comment 2: The proposed indoor radon decay product standard of 0.015 WL is inconsistent with the implementation guides for Grand Junction, EPA's guidance for Florida phosphate lands and standards proposed under RCRA. (I-1, I-4, I-6, I-10, F-2, F-7, H-18)

Response: EPA's guidance for Florida phosphate lands and standards proposed under RCRA were developed to address specific sets of circumstances. Since we know of no threshold below which radiation is harmless, these standards have all been set with the ALARA (as low as reasonably achievable) principle in mind, as applied to those circumstances. In this sense, the standards cited are consistent, even though the numerical criteria may differ slightly. Based on further evaluation of costs and risks, however, we have revised the indoor radon decay product standard (see response to Comment 1, above). This revision will make the standard easier and less costly to implement, and more consistent with previous guidance.

Comment 3: The DEIS states that perhaps 10 percent of all U.S. homes may have radon decay product concentrations in excess of 0.015 WL. The proposed indoor cleanup standard is too low and should be raised to a level which does not commonly occur as a result of naturally-occurring radon sources. (S-1, S-2, S-11, I-4, I-10, F-7, F-11, H-1, H-2, H-13)

Response: The Final Standard has been set at levels that do not commonly occur as a result of naturally occurring radon sources (see Table 2.7, FEIS). However, because background levels exhibit such a wide range of values, there are undoubtedly homes without tailings that exceed even the upper limit of the standard. Nevertheless, we believe our standard is [illegible] because it is practical, cost effective, and provides the necessary flexibility to deal with complications of [illegible] background levels (see response to Comment 1, above).

Comment 4: It is premature to set standards without a better knowledge of indoor background. A survey of indoor radon levels should be done (national in scope, or at least including all the relevant mill areas) before a standard is issued. (I-2, I-4, F-2, F-10, H-18)

Response: We disagree. Extensive experience shows that uranium mill tailings used in or near buildings often substantially elevate indoor radon decay product levels (see Section 3.4 of the FEIS), and that reducing such elevated levels is practical (FEIS, Sections 5.3 and 7.1)). The purpose of the PL 95-604 program is to remedy such health hazards of tailings. It would be impractical to obtain significant [illegible] public health protection afforded by this standard until a large-scale survey of indoor radon levels is completed.

Comment 5: Because the proposed indoor radon decay product standard of 0.015 WL is within the range of commonly-occurring indoor background levels, it will be difficult to determine when and if the standard has been met. Also, it will often be necessary to certify that mill tailings are not present when the radon decay product concentration exceeds 0.015 WL. This will cause problems because it will not (always) be possible to determine if the radon decay product concentration exceeds the limit because of the presence of mill tailings or because of natural background. Therefore, the lack of flexibility in the proposed standard will make the implementation of the standard difficult, costly, and time consuming. It will result in the unnecessary removal of material from around and under structures or the frequent use of the exceptions procedure.

To avoid these difficulties we suggest that the standard be expressed as a range of values similar to the Surgeon General's guidelines for Grand Junction (i.e., 0.01 to 0.05 WL above background). (P-5, I-3, F-1, F-2, F-13, F-14)

Response: The Agency has revised the indoor radon decay product standard after considering comments and reevaluating the costs and benefits of alternative standards (see response to Comment 1, above). The Final Standard is expressed as a range of values and supplemental standards may be used where meeting the standard would be [illegible] the necessary flexibility to deal with any complications from high concentrations of naturally-occurring radionuclides and to avoid unnecessary and costly remedial actions that may produce only marginal improvements.

The Surgeon General's guidelines, which the commenter recommends we use, were established at a time when risks from radon decay product exposure were thought to be about one-half of our current estimates. We have analyzed the cost data from the Grand Junction remedial action program and concluded that the cost to meet the Final Standard would not be significantly different from the cost incurred under the Surgeon General's guidelines, [illegible] properties and [illegible] are applied where necessary. Therefore, we believe the additional health protection afforded by our Final Standards as compared to the Surgeon General's guidelines is justified.

Comment 6: Setting standards for remedial action at levels commonly existing in houses where there are no tailings present may have an adverse effect on the public. Many people will be worried that their homes are unsafe. EPA should discuss the impact of the standard on homes with naturally-occurring levels above the standard and should also discuss the feasibility for remedial action for such homes. (F-9, H-2, H-5)

Response: The Final Standard for indoor radon decay products involves levels that do not commonly occur in houses. However, there undoubtedly are a few houses that exceed these levels where tailings are not the cause. EPA is concerned about the existence of elevated levels of naturally occurring radon decay products in houses and has devoted sizeable resources over the last several years in studying this problem. However, additional studies are needed to better define the scope of this problem and to identify practical remedial actions for application on a national scale.

Comment 7: The 0.02 mR/hr gamma standard is too low because it is close to background and leaves no options for remedial work, except removal. (S-1, S-15, H-2)

Response: The 0.02 mR/hr gamma standard intentionally favors the removal option because removal is the only practical solution for limiting indoor gamma radiation. However, we believe the indoor gamma radiation standard, which permits a value considerably above background is appropriate and can be readily implemented.

Comment 8: EPA should set a radon standard of [illegible] pCi/l as an alternative to the radon decay product (WL) standard. This would provide greater flexibility in monitoring buildings. (F-3)

Response: We prefer a standard expressed as a radon decay product concentration because of its more direct relation to the major health hazard, which is lung cancer. However, expressing the cleanup standard for buildings in terms of an indoor radon decay product concentration does not preclude using radon measurements to determine compliance with the standard (i.e., as a surrogate measurement). We purposely avoided including specific details on measurement procedures in our rulemaking to give the [illegible] flexibility to select the most practical [illegible]

[illegible] [illegible] indoor cleanup standards for buildings [illegible] sufficient health protection. The indoor [illegible] .02 mR/hr would exceed the average annual [illegible] percent. (P-1, P-11)

Response: Lowering the indoor gamma radiation standard could virtually eliminate flexibility in remedial methods for satisfying the more significant (in terms of risk) standard for radon decay products. We believe preserving this flexibility outweighs the small additional health benefit a lower gamma radiation standard would provide for the few individuals that may be affected by it.

Comment 10: The discussion in the DEIS of background levels of radon decay products should refer to data compiled by the U. S. Radiation Policy Council (45 FR 43510, June 27, 1980). These data indicate a mean indoor radon decay product background of 0.01 WL, over twice the 0.004 WL mean stated in the DEIS. (P-10)

Response: The data reported by the Radiation Policy Council were assembled by EPA staff some time after the DEIS was prepared. These and other data that better document the indoor background in western U. S. homes are included in the FEIS. The implication of a 0.01 WL mean background level is misleading, however. A disproportionate number of the surveys cited in 45 FR 43510 were in areas with enhanced natural sources of radon, so that any national mean implied from these data would be biased high.

Comment 11: Standards for indoor radon decay products for the general public are still being studied by EPA and other Federal agencies. Because these standards and the remedial action standards for uranium mill tailings are closely related, they should not be promulgated separately. [illegible])

Response: [illegible] present plans to set indoor radon decay product [illegible] general public. In any case, however, such [illegible] the same time or be identical to the [illegible] uranium mill tailings because the social, [illegible] considerations may be quite different.

D.5.3 Cumulative Lifetime Dose Equivalent Standard

Comment 1: Section 192.12(c) of the proposed standards dealing with the cumulative lifetime radiation dose equivalent is complicated and difficult to implement. This part of the standards should be eliminated or expressed as a numerical value. (S-2, S-18, H-7)

Response: We agree with the thrust of the comment. We don't know of any circumstances in this remedial action program where our cleanup standards for radium-226 and its decay products will not adequately deal with the radiation hazard. The need for cleanup standards addressing other radionuclides appears minimal, and the proposed Section 192.12(c) would indeed be cumbersome to apply if there were a need. Therefore, we have deleted this provision and replaced it with a simpler formulation as part of the Supplemental Standard [see 40 CFR 192.21(f) and 192.22(b)].

D.5.4 Exceptions

Comment 1: As proposed, the standards will require extensive exceptions. More flexibility is needed to avoid exceptions. The levels of bureaucracy needed to handle exceptions are burdensome. (S-5, S-18, F-14, H-7, H-11, H-13)

Response: We agree that flexibility is needed. The numerical limits of the standards have been raised to more easily achievable levels that are more readily distinguishable from background levels. In addition, we have changed the procedures for situations in which it would be unreasonable to satisfy the standards from an "exceptions" process to one in which the implementing agencies apply "Supplemental Standards" (see Chapter 8 of the FEIS and 40 CFR 192, Subpart C). We believe the revised standards minimize the need for exceptions and provide very simple procedures when there is a need.

Comment 2: Section 192.20(c) of the proposed exceptions to the standards should be eliminated since the language "slightly exceeded" is too vague to be enforceable and seriously weakens the standards of Table B. (P-22)

Response: We have replaced the "exceptions" process with "Supplementary Standards" (see response to Comment 1, above). The expression "slightly exceeded" referred to in the comment is no longer used. We have retained the essence of the proposed criterion, however, because we believe it is needed to avoid expenditures that are clearly unreasonably high relative to the obtainable benefits (see Section 192.21(d) of the Final Standard).

D.6 Implementation

Comment 1: EPA should establish requirements for or provide guidance on the methods, procedures and conditions to be used in monitoring compliance with the proposed standards. (P-3, P-11, P-17, S-5, S-18, F-2, F-8, F-9, F-10, H-7, H-23)

Response: The Agency considers the procedures and methods used in determining compliance to be an important part of making the standards effective. We considered including details on these procedures as part of our rulemaking. However, we chose to allow the implementing agencies to establish suitable procedures for the widely varying and incompletely known conditions of each processing site. The Agency is, however, providing general guidance on how the standards should be implemented (Subpart C of the Final Standards). The Agency is confident that DOE and NRC, in consultation with EPA and the States, will adopt implementation procedures consistent with the intent of the standards.

Comment 2: EPA should consider the need to specify confidence limits for the measurements to be used in determining compliance with the proposed standards. (P-4, I-1)

Response: The Agency does not believe it is appropriate or useful to specify confidence levels for the measurements to be used in determining compliance with the standard. Such limits are an integral part of a compliance monitoring program and we expect DOE to consider such limits in designing and implementing the remedial action program.

Comment 3: Gamma survey techniques should be used to determine compliance with the radium-226 open lands cleanup standard. These techniques are more practical than soil sampling procedures during actual cleanup operations. (S-18, F-10)

Response: We agree and expect that gamma survey techniques will be widely used as a surrogate measurement for radium-226 in determining compliance with the land cleanup standard (see Section 192.20(b) of the Final Standard).

D.7 Miscellaneous

Comment 1: The attenuation of tailings gamma radiation by soil overburden is not given correctly by Figure 5-2 in the DEIS. The attenuation of gamma radiation from tailings by overburden does not follow an exponential law, as would be the case for a point source. The concept of half-value-layer is not applicable to extended sources. Instead the attenuation can be shown to follow a second-degree exponential integral. (P-19)

Response: We agree that the gamma attenuation from an earthen cover is underestimated in the DEIS. The discussion in the FEIS has been modified accordingly. This further supports our conclusion that using an earthen cover to control radon will greatly reduce the direct gamma radiation from the tailings.

Comment 2: The Federal Government is considering disposing of wastes from the inactive uranium processing site at Canonsburg, Pa., at the Ash and Dimsmore sites in Hanover Township, Pa. We object to this disposal plan because we are concerned that these wastes will have an adverse health impact on our community. We recommend that any plans to transfer these wastes to our area be dropped and other alternatives considered. (P-7, P-10, P-12, P-13, P-16)

Response: Public Law 95-604 requires the Department of Energy to select and perform remedial actions for inactive processing sites in accordance with the EPA standards and in cooperation with the States where the sites are located. Selection and performance of remedial actions will be subject to the concurrence of the Nuclear Regulatory Commission. It is our understanding that DOE will prepare an Environmental Impact Statement covering alternative remedial actions for the Canonsburg site and will provide several opportunities for public comment prior to selecting a final remedial action plan.

Comment 3: Canonsburg Industrial Park in Canonsburg, Washington County, Pennsylvania, has been designated as one of the sites for remedial action under Public Law 95-604. There is great public interest and concern about how and where the wastes from the site will be disposed. EPA should hold public hearings on the Remedial Action Standards for Inactive Uranium Processing Sites in or near Canonsburg and extend the comment period for these standards to provide additional time for citizens to voice their concerns. (H-21, H-22)

Response: EPA held public hearings on the Proposed Standards for Inactive Uranium Processing Sites in Salt Lake City, Utah; Durango, Colorado; and Washington, D.C. Time and resources did not allow the Agency to conduct public hearings in all communities where inactive uranium processing sites are located. Within these limitations, EPA believes the chosen locations provided the greatest opportunity for public participation. EPA did extend the comment period for these standards for an additional 2 months.

Comment 4: What are the hazards from uranium mill tailings? (H-3, H-10)

Response: Uranium mill tailings can affect people's health through four basic pathways. These are: (1) diffusion of radon-222 gas from the tailings into air and into houses; (2) dispersion of small particles of tailings materials into air; (3) external gamma radiation from tailings; and (4) contamination of ground water or surface water. Chapter 4 of the FEIS discusses the health risks from uranium mill tailings in detail.

Comment 5: How much more tailings material will be generated between now and the year 2000, and what provisions have been made to address future problems? (H-3)

Response: The Nuclear Regulatory Commission has estimated that an additional 4.7×10^8 metric tons of tailings will be generated by the year 2000 to fulfill future energy requirements (NRC80). Public health, safety, and the environment will be protected from these materials by standards promulgated by EPA under Public Law 95-604. These standards will be implemented and enforced by NRC or its Agreement States, pursuant to the Atomic Energy Act, as amended by PL 95-604.

Comment 6: EPA states that tailings at 5 pCi/g of radium-226 will have less than 5 times the radon emanation of ordinary soil, which presumably has about 1 pCi/g of radium-226. This implies that the emanating power of soil and tailings are the same, which, in general, is not a valid assumption. (P-5)

Response: The emanating power of both soil and tailings show rather large variations. Emanating power measurements of different soils range from a few percent to over 20%. Measurements of tailings range from 6% to over 40%. Because of these variations, the emanating powers of soils and tailings cannot be precisely specified. Nevertheless, since the emanating power of both varies through a similar range, it is reasonable for general comparison purposes to assume no significant difference between the emanating power of soil and tailings.

Comment 7: The DEIS in Chapter 4 provides estimates of the number of fatal lung cancers that may result from exposure to radon decay products from the tailings piles. (a) What would be the expected number of lung cancer fatalities in the same population group due to all causes? (b) How many of these fatalities are estimated to be due to smoking? (H-4)

Response: (a) The estimated number of lung cancer fatalities for a 100-year period for causes other than radon decay product exposure are shown below; the population groups listed in the table are the same as in Table 4-3 of the FEIS:

Site Name & Population	Cancers Expected in 100 yrs
Salt Lake City, Utah	
Local Population (361,000)	5,100
Regional Population (494,000)	7,000
Mexican Hat, Utah	
Regional Population (14,100)	200
Grand Junction, Colorado	
Local Population (39,800)	820
Regional Population (30,600)	630
Gunnison, Colorado	
Local Population (5,060)	100
Regional Population (17,060)	350
Rifle, Colorado	
Local Population (2,700)	55
Regional Population (35,900)	740
Shiprock, New Mexico	
Local Population (7,200)	140
Regional Population (63,600)	1,200

The lung cancer fatality rates used for these estimates were based on 100 times the number of 1970 lung cancer deaths for the State divided by the 1970 State population. The 1970 values are summarized below. Several assumptions are apparent, the prime one being that the 1970 rate represents the 100-year period.

State	1970 Lung Cancer Fatalities	1970 Population x 10^{-5}	1970 Crude Lung Cancer Mortality Rate per 10^{-5} persons
Utah	150	10.66	14.07
Colorado	468	22.81	20.52
New Mexico	195	10.23	19.06

(b) It is impossible to say how much of the expected lung cancer from causes other than radiation exposure are due to smoking because smoking may have a large promotional role as well as a possible initiation role in the development of lung cancer. We are also unable to predict smoking patterns for the next 100 years. If smoking declines markedly, however, we would expect a large reduction in the number of lung cancers. The data on uranium miners indicates that exposure to radon and cigarette smoke increases their lung cancer death rate. This may be due to the earlier appearance of lung cancer among exposed miners who smoke. The risk from smoking and radon exposure combined as compared to the risk from radon exposure in nonsmoking miners now appears less than was indicated in the early studies of uranium miners. The data are insufficient for making quantitative risk estimates, however.

Comment 8: Chapter 4 of the DEIS assumes a linear risk associated with radiation health effects with no damage threshold, but assumes a threshold for non-radioactive toxic materials. What would be the effect on the conclusions reached if a damage threshold were assumed for radiation health effects? (H-4)

Response: The scientific concensus today is that there is no threshold for a carcinogen. Radioactive materials were treated as carcinogens and, therefore, no threshold was postulated in the dose-response calculations. Even if a threshold were postulated for radiation-related health effects estimates it would be unlikely to affect the final conclusions appreciably. The majority of the health effects are related to radon decay product exposure and the only estimate of a "quasi-threshold" for such exposure, derived from a mathematical analysis of miner studies, is "less than 3 WLM" (MY79a). A 3 WLM exposure is well within the exposure range expected over several years for members of the general population. In addition, how much lower a threshold may be than 3 WLM is not known, but the data agree very well, both above and below 3 WLM, with results of a linear risk estimation model.

Comment 9: What is the estimated number of construction and traffic fatalities (associated with the remedial actions) as compared with the number of cancer deaths avoided? (H-4)

Response: The number of accidental deaths that may result from remedial actions at any specific inactive site would be highly dependent on the labor intensiveness of the particular action. The most severe such case is moving a large tailings pile. The risks of such an activity can not be estimated without specific information on the locale and the details of the work to be performed. However, we have estimated these risks on a generic basis for average tailings piles. Estimates of the number of accidental deaths that could be associated with different tailings disposal options are shown in Table 6-5 of the FEIS. Estimates of the number of cancer deaths avoided for the various disposal options are shown in Table 6-6 of the FEIS.

Comment 10: The mill tailings standards have not been critically reviewed in total because the amount of current and future (active) tailings are at least 22 times more than the amount of the inactive tailings. Economic impact of these standards on the mining, energy, and defense sector have not been addressed. (F-15)

Response: We are currently developing standards for tailings at active uranium mills. The economic impact of alternative standards will be fully addressed during the standards development process.

Comment 11: No effective methods are known for disposal of uranium mill tailings piles and cleanup of contaminated land. Until guaranteed remedial action technology is invented, we could halt the mining of uranium except for medical and research purposes. (P-14)

Response: We have reviewed the capabilities of established remedial actions and those under development (see the FEIS, Chapter 5). Remedial methods need not be totally effective to be useful. Our Final Standards take account of practical limitations of remedial methods. They require hazards to be reduced to levels that we believe are generally as low as reasonably achievable considering the pertinent technical, economic, and social circumstances. We believe this carries out Congress' objectives for the remedial action program. Halting uranium mining, on the other hand, would reduce the generation of new tailings, but not the potential hazards of existing tailings.

Comment 12: EPA must make a finding that there is a significant risk before promulgating these standards. (I-10, H-18)

Response: Without commenting on the need for EPA to make such a finding under the Uranium Mill Tailings Radiation Control Act (UMTRCA), it is clear that tailings pose a significant risk. Our estimates of the risk of inhaling radon decay products from tailings are based on observed risks for underground miners exposed to such products in mine atmospheres. We estimate that members of the general public who live their lifetimes in houses built on or with tailings often have greater than 1 chance on 100 of dying from lung cancer related to radon from the tailings (see FEIS, Chapters 3 and 4). There may be several hundred such houses (FEIS, Chapters 3 and 7) that are eligible for remedial actions under our Final Standards. Furthermore, people living very near tailings piles are subject to risks of comparable magnitude. Table 4-5 of the FEIS contains examples, based on radioactivity levels measured at the specific locations. We believe risks at these levels are significant by any reasonable test.

We note that a U. S. Court of Appeals has recently ruled that the NRC needn't reach a finding of significant risk before issuing regulations under UMTRCA for tailings at active mills (Kerr-McGee Nuclear Corp., *et al.*, vs. NRC, *et al.*, 10th Circuit, 80-2043, March 17, 1982). Notwithstanding this, the Court also concluded that NRC's evaluations of the hazards of uncontrolled tailings from active mills established the significance of the associated risks.

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APPENDIX E

LETTERS OF COMMENT AND TESTIMONY SUBMITTED AT PUBLIC HEARINGS

APPENDIX E

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*Oral testimony. Available for review in Docket A-79-25, Environmental Protection Agency, Gallery One, West Tower Lobby, 401 M St., S.W., Washington, D.C.

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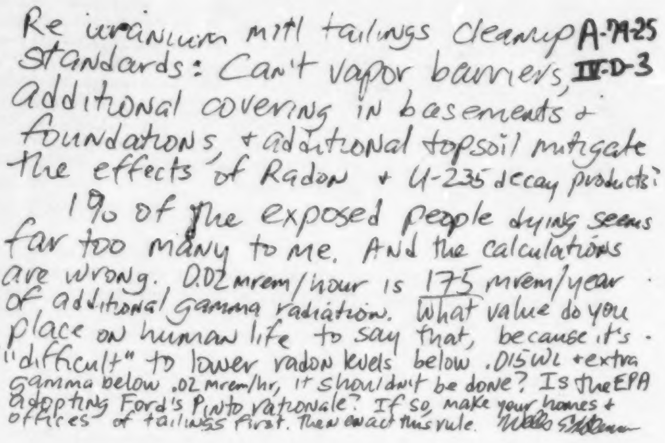
Typewritten copy of undated post card from Wells Eddleman, Durham, North Carolina:

"Re uranium mill tailings cleanup standards: Can't vapor barriers, additional covering in basements & foundations, & additional topsoil mitigate the effects of radon & U-235 decay products?

"1% of the exposed people dying seems far too high to me. And the calculations are wrong. 0.02 mrem/hour is 175 mrem/year of additional gamma radiation. What value do you place on human life to say that, because it's "difficult" to lower radon levels below .015 WL & extra gamma below .02 mrem/hr, it shouldn't be done? Is the EPA adopting Ford's Pinto rationale? If so, make your homes and offices of tailings first, then enact this rule."



Re uranium mill tailings cleanup standards: Can't vapor barriers, additional covering in basements & foundations, & additional topsoil mitigate the effects of Radon & U-235 decay products?

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A-79-25
IV-D-3

P-2

A-79-25
IV-D-6

16 June 1980

MEMO TO: U.S. Environmental Protection Agency, Central Docket Section, 401 M Street, S.W., Washington, D.C.

FROM: Dr. Edward A. Martell, National Center for Atmospheric Research*, Boulder, Colorado

SUBJECT: Comments on "Proposed Cleanup Standards for Inactive Uranium Processing Sites "(Docket No. A-79-25)

RECEIVED
ENVIRONMENTAL PROTECTION AGENCY
JUN 23 1980
CENTRAL DOCKET SECTION

In reply to your invitation for comment on "Proposed Cleanup Standards for Inactive Uranium Processing Sites," Federal Register, 27370-75, April 22, 1970, I wish to direct your attention to several aspects of health risks from uranium mill tailings which have been inadequately considered, or overlooked, as follows:

1. Inhaled Airborne Mill Tailings:

Although not included in the EPA listing of health hazards from tailings, the inhalation of airborne tailings particles of respirable size is potentially one of the most serious public health hazards. In a study of windblown mill tailings near Grants, New Mexico, Sehmel (1978) reports results which show that, in the respirable size fraction of airborne particles, the average concentrations of radium-226 thorium-230 and lead-210 are each about 1,000 picocuries per gram. Undoubtedly, much of the particulate material in this size fraction is relatively low in radioactivity and the more radioactive particles may have specific activities of 10^4 to 10^5 picocuries per gram or higher. Thus, the alpha activity per particle may approach or exceed that of uranium metal dust which is known to be a very effective carcinogenic agent (Hueper et al., 1952). The alpha specific activities of airborne mill tailings particles of respirable size must be determined in order to assess the potential inhalation hazards. The solubility of the radioactive particles also must be determined. Insoluble alpha emitting particles of respirable size will contribute to the risk of lung cancer. However, if the radioactive particles of respirable size are soluble, the bone-seeking radioisotopes (uranium, radium-226, and lead-210) will contribute to the risk of leukemia and bone cancer.

---

*The National Center for Atmospheric Research is sponsored by the National Science Foundation.

2. Tailings Contamination of Vegetation:

There is a substantial degree of contamination of vegetation by airborne radioactivity downwind of uranium mill operations. Thus, for example, the concentrations of radium-226, thorium-230 and uranium on vegetation one mile east of the Gas Hills Uranium Mill in central Wyoming were 25 to 100 times higher than background vegetation levels at greater distances (NUREG-0441, January 1979). The surface soil levels of these radioisotopes also vary widely with distance and direction. It is to be expected that uranium mill tailings also will be widely redistributed in semi-arid areas. Strong, gusty winds of speeds exceeding 15 to 20 m/sec are sufficient to resuspend dry tailings deposits. The prevailing direction of such winds locally will determine the pattern of contamination. The contamination of surface soils and vegetation in open lands in this manner gives rise to possible adverse effects on grazing animals and to significant levels of contamination in dairy products, cereal grains and other agricultural products. Standards for radionuclide concentrations of vegetation on grazing lands and crop lands should be developed.

3. Ground Water Contamination:

In general, uranium mill tailings contain high concentrations of sulfates, an acidic and hygroscopic mixture which retains moisture and promotes the solution and mobility of uranium, thorium and other mineral constituents (Markos, 1979). As Markos points out, these characteristic of tailings result in transport of contaminants to the upper surface of tailings deposits where they can be redistributed by winds and leached by precipitation and surface waters. These migrating salts also are damaging to the vegetation of any protective soil and plant cover used to stabilize tailings deposits. The solubility and mobility of uranium and thorium radionuclides in tailings deposits indicates that uranium and thorium contamination of ground waters, streams, wells and other water supplies is to be expected. Standards for uranium and thorium contamination of water supplies should be developed. In this connection it is noted that uranium is just as effective as radium in the production of malignant bone tumors (Finkel, 1953). If the uptake and retention of ingested uranium in skeletal tissue is higher or lower than that for radium, the standard for uranium in drinking water should be correspondingly higher or lower than the existing standard of 5 picocuries per liter for radium-226.

4. Proposed Cleanup Standards for Open Lands:

The proposed limit of 5 pCi/gm of radium-226 for cleanup of open lands may be seriously inadequate, particularly in the downwind environs of tailings deposits. Mill tailings deposited on the surfaces of open land can give rise to unacceptable levels of airborne alpha emitting dust particles of respirable size when disturbed by winds, vehicular traffic, human activity, etc. (see Comment #1, above). The hazards from resuspended alpha emitting dust particles must be evaluated. The levels of external gamma radiation and of radon emission should not be the only criteria for cleanup of mill tailings contamination on the surfaces of open lands.

5. General Comment:

The concern about lung cancer risks from indoor radon progeny is based on the high incidence of lung cancer in uranium miners. However, uranium miners are exposed not only to a high cumulative exposure to radon progeny, but also to aerosol constituents of uranium mine atmospheres, including alpha emitting uranium mineral dust particles. Uranium miners who smoke cigarettes have a much higher incidence of lung cancer than non-smoking miners. The miners who smoke cigarettes are subject to the additional risk from inhaled radioactive smoke particles (Martell, 1975). Thus, the uranium miner is not subject to high radon progeny alone, but to a combination of this and other factors which combine to contribute to a high incidence of lung cancer.

It has been noted (Morken, 1959) that chronic expsoure to high concentrations of radon progeny alone is not effective in the induction of bronchial cancer. Simularly, estimation of lung cancers in the general population based on the uranium miner incidence and on cumulative radon progeny exposure alone, results in the prediction of an excessively high incidence (Cliff, 1978). It is proposed that insoluble alpha emitting particles which are inhaled and retained in the lung (Hueper et al., 1952; Martell, 1975) play a key role in bronchial cancer induction.

6. References:

(1) Cliff, K.D., "Assessment of Airborne Radon Daughter Concentrations in Dwellings in Great Britain, Phys. Med. Biol. 23, 696-711, 1978.

(2) Finkel, M.P., "Relative Biological Effectiveness of Radium and Other Alpha Emitters in CF No. 1 Female Mice, Proce. Soc. Exp. Biol. (N.Y.) 83, 494-498, 1953.

(3) Hueper, W.C., J.H. Zuefle, A.M. Link and M.G. Johnson, "Experimental Studies in Metal Cancerigenesis. II. Experimental Uranium Cancers in Rats," J. National Cancer Inst. 13, 291-305, 1952.

(4) Markos, G., "Geochemical Mobility and Transfer of Contaminants in Uranium Mill Tailings," Proc. Sympos. on Uranium Mill Tailings Management, Fort Collins, CO, 1979.

(5) Martell, E.A., "Tobacco Radioactivity and Cancer in Smokers," American Scientist 63, 404-412, 1975.

(6) Morken, D.A., "The Biological Effects of Radon on the Lung," Proceedings Conference on Noble Gases, ERDA-TIC CONF.-730915, Stanley, R.E. and Moghissi, A.A., Editors, 1973.

(7) NUREG-0441, DEIS, Gas Hills Uranium Mill, Docket No. 40-299, U.S. Nuclear Regulatory Commission, January 1979.

(8) Sehmel, G.A., "Airborne Particulate Concentrations and Fluxes at an Active Uranium Mill Tailings Site," Proceedings NEA Seminar on Management, Stabilization and Environmental Impact of Uranium Mill Tailings, Albuquerque, N.M., July 1978.

Received
Criterial & Standards Division, ORP
Date: JUN 20 1980

A-79-25
IV-D-7

Monsanto

MOUND FACILITY
Operated for the United States
Department of Energy

June 16, 1980

Dr. Stanley Lichtman
Docket No. A-79-25
Criteria and Standards Division (ANR-460)
Office of Radiation Programs
U. S. Environmental Protection Agency
Washington, D. C. 20460

RECEIVED
ENVIRONMENTAL PROTECTION
AGENCY
JUN 24 1980
CENTRAL DOCKET
SECTION

Dear Dr. Lichtman:

Attached please find comments from personnel in the Radon Program Group at Mound Facility regarding the "Proposed Cleanup Standards for Inactive Uranium Processing Sites," 40CFR192.

Mound Facility's Radon Group is currently performing environmental radon and decay products evalutions at former MED/AEC sites (FUSRAP) and will in the future perform the same evaluation at inactive Uranium Mill Tailings sites for the Department of Energy's Environmental Control Technology Division, Germantown, Maryland.

In light of our involvement and experience of measuring radon and its decay products, we offer the following comments and opinions on the proposed cleanup standards for Inactive Uranium Processing Sites, 40CFR192, FR45, PP27370-27375. Docket No. A-79-25.

1. The proposed standard for radioactivity indoors is an average annual radon decay-product concentration of 0.015 WL including background. Because this is based on an annual average concentration, monitoring over a period of at least one year is implied. In our opinion, the state-of-the-art instrumentation for long-term monitoring of radon decay-products concentrations is less advanced, less reliable, and less practical than that for the long-term monitoring of radon. Obviously, if the annual average radon concentration in a building is equal to or less than 1.5 pCi/liter, then the proposed standard of 0.015 WL is met. We strongly recommend that a standard for the average annual indoor radon concentration of 1.5 pCi/liter including background be included as an alternative to the standard of 0.015 WL. This would provide greater flexibility in the monitoring of buildings, because instrumentation could be used to monitoring either radon or radon decay products as deemed

P-3

appropriate by specific sets of conditions found in different buildings. Also, this approach of alternate standards, one based on radon concentration and the other on radon decay-product concentration, is consistent with that followed by the Nuclear Regulatory Commission in 10CFR20.

2. The proposed standard for radon decay products indoors (0.015 WL) and the alternate recommended above for radon indoors (1.5 pCi/liter) are based on an annual average. We recommend that some guidance be included as to what constitutes an acceptable monitoring protocol for determining an annual average radon or radon decay-product concentration.

3. The proposed standard for radium-226 in soil on open land is 5 pCi/gm in any 5-cm thickness within 1 foot of the surface or in any 15-cm thickness below 1 foot. Our interpretation of this standard leads us to the conclusion that an infinite number of samples would have to be analyzed to certify that this standard has been met. We recommend that the meaning of "any 5-cm thickness" and "any 15-cm thickness" be stated more clearly.

Thank you very much and if we can assist in further details don't hesitate to contact us.

Sincerely,

William G. Yates

William G. Yates
Radon Program Manager

WGY:km

P-4

A-79-25-IV-D-11

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JUN 30 1980
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Battelle
Pacific Northwest Laboratories
P.O. Box 999
Richland, Washington U.S.A. 99352
Telephone (509) 376-0303
Telex 15-2874

June 23, 1980

Docket No. A-79-25
Environmental Protection Agency
Central Docket Section, Room 2903B
401 M Street, S.W.
Washington, DC 20460

Gentlemen:

COMMENTS ON "EPA PROPOSED CLEANUP STANDARDS FOR INACTIVE URANIUM PROCESSING SITES" PUBLISHED IN THE FEDERAL REGISTER VOL. 45, NO. 79, TUESDAY, APRIL 22, 1980

Our overall impression of the proposed standards is that EPA has taken a flexible approach, allowing DOE and NRC considerable freedom to choose appropriate methods of implementation for each specific site. We agree with this approach since sampling design and analysis requirements may vary from site to site. However, it is important that EPA realizes the proposed numerical standards are ambiguous with respect to their statistical interpretation and implementation. For example, the word "average" is not defined. Does it refer to the arithmetic mean ("expected value" in statistical language), the median, geometric mean, or mode? Also, the surface area to which the average applies and from which measurements or samples are taken is not specified. For example, are average radium-226 concentrations in soil applicable to surface areas of 1 m^2, 10 m^2, 100 m^2, etc.?

A more important point perhaps is that the probability of taking remedial action (RA) depends on the particular decision rule chosen, i.e., whether decisions are made on the basis of the estimated average $\bar{x}$ or on an upper or lower confidence limit on the true (unknown) average μ. If the decision rule

$$\text{"Take RA if } \bar{x} \geq \text{standard"} \qquad (1)$$

is used, this implies a 50% or greater chance of taking remedial action if the true average μ is equal to or greater than the standard. If the decision rule is

$$\text{"Take RA if } \bar{x} + s_{\bar{x}} \geq \text{standard,"} \qquad (2)$$

i.e., if the upper 84% (one-sided) confidence limit on μ is greater than or equal to the standard, this implies an 84% or greater probability of taking RA when $\mu \geq$ standard. ($s_{\bar{x}}$ is the standard error, i.e., the standard deviation of $\bar{x}$.) If the chosen decision rule is

Battelle

Gentlemen
June 23, 1980
Page 2

"Take RA if $\overline{x} - s_{\overline{x}} \geq$ standard," (3)

i.e., if the lower 84% (one-sided) confidence limit on μ is greater than or equal to the standard, this implies a 16% or greater probability of taking RA when $\mu \geq$ standard. (The above statements assume $\overline{x}$ has a normal (Gaussian) distribution.) Other probabilities can be specified by using a multiplier of $s_{\overline{x}}$ other than 1.

Decision rule (2) above means that RA would take place even when $\overline{x}$ is less than the standard. Of course this would increase RA costs. This rule essentially says that RA will be conducted unless there is statistical evidence that $\overline{x}$ is significantly below the standard. Decision rule (3) above might be the view point chosen for a certification survey after RA has been completed. Rule (3) says that additional RA will not be taken unless there is statistical evidence that $\overline{x}$ is significantly above the standard.

The main point is that there are various viewpoints that can be taken that influence the probabilities of taking RA. EPA should be aware of these different approaches and consider whether additional comments are needed in the standards. We believe it's best to leave such decisions to the implementers since this allows greater flexibility. Two references that discuss the probability aspects of decision rules (1), (2), and (3) are

> Leidel, N.A., K. A. Busch, and J. R. Lynch. Occupational Exposure Sampling Strategy Manual, U.S. Dept. of Health, Ed. and Welfare, Nat. Institute for Occupational Safety and Health, Cincinnati, DHEW (NIOSH) Publ. No. 77-173, Jan. 1977.
>
> Bartlett, R. P., Jr. and L. P. Provost, "Tolerances in Standards and Specifications," Quality Progress, Dec. 1973.

Sincerely,

Dale H. Denham

D. H. Denham
Sr. Research Scientist
Environmental & Risk Assessment

DHD:ncv

A-79-25
III-D-8

THE UNIVERSITY OF TEXAS
HEALTH SCIENCE CENTER AT HOUSTON
SCHOOL OF PUBLIC HEALTH

[illegible]
[illegible]

P.O. BOX [illegible]
HOUSTON, TEXAS [illegible]

June 23, 1980

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JUN 26 1980
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SECTION

Docket A-79-25
EPA Central Docket Section
Room 2903 B,
401 M Street, S.W.
Washington, D.C. 20460

To whom it may concern:

I have examined the proposed rule 40CFR192 beginning on page 27370 of the April 22, 1980 Federal Register and offer the following comments.

On page 27372- midway down the first column, it is stated that tailings at 5 pCi/g of radium-226 will have less than 5 times the radon emanation of ordinary soil which presumably has about 1 pCi/g of radon-226. This implies that the emanating power of soil and tailings are the same which in general is not a valid assumption.

On page 27372 midway down, four characteristics of a standard are listed. The fourth criterion, "practical" states that it must be possible to accomplish the requirements in a reasonable time with the techniques and personnel available. What does "available" mean, particularly with regard to personnel? Does it mean personnel already hired by an agency, say DOE, and readily divertable from other less pressing tasks or does it mean available to be hired? Similarly for techniques - does this imply techniques available routinely to the agency or techniques known somewhere in the country or perhaps the world which must be purchased or adopted?

While it is already recognized that your proposed standard of 0.015 WL including background may be lower than concentrations observed in non-contaminated structures, I would like to point out that recently available data have strongly supported this fact. A canadian study[1] involving nearly 10,000 ordinary dwellings found that 759 or 7.6% of them had radon daughter concentrations equal to or greater than 0.15 WL. This study consisted of grab samples taken during the summer months and may be biased to the low side for that reason. Rundo et al[2] studied 22 ordinary houses in Illinois and found that 9 of 22 exceeded 5 pCi/l of radon. Those radon values would be expected to give rise to working level values greater than 0.015.

---

[1] McGregor et al, Health Physics (in press).

[2] Rundo et al, Health Physics 36, 729-730.

June 23, 1980
Docket A-79-25
Page 2.

While less applicable to the U.S. situation, Stranden et al[3] found that 15 out of 140 dwellings studied in Norway had radon daughter concentrations exceeding 0.014 WL. (The data presentation in the paper did not allow determination of the number greater than .015). These data suggest that the rules developed to implement the standard must be very carefully thought through to prevent needless cost and anxiety.

In section 192.12(a) you state criteria for average radium-226 concentrations in soils. You do not specify what surface area may be used in determining this average however, and this would seem to be a serious flaw.

Sincerely,

Thomas F. Gesell, Ph.D.
Associate Professor of
Health Physics

TFG:pd

---

[3] Stranden et al, Health Physics 36, 413-421.

A-79-25
II-D-17

827 Jamaica Road
Schenectady, NY 12309
February 24, 1981

RECEIVED
NVIRONMENTAL PROTECTI
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MAR 05 1981
CENTRAL DOCKET
SECTION

U.S EPA
Docket No. A-79-25
West Tower Gallery 1,
401 M. Street, S.W.
Washington, D.C. 20460

Dear Sirs:

Thank you for soliciting my comments on proposed remedial action (40 CFR 192) for residual radioactive material from inactive uranium processing facilities.

The proposed standards for remedial action appear to me to be flawed by the fact that they are based on the presumed historical origin of particular radioactive nucleii rather than on their presumed future effect on public health. While this absurdity may be the result of poorly written legislation, it is inexcusable that EPA allowed itself to be placed in such an obviously untenable position.

Sincerely,

Henry Hurwitz, Jr.

P-7

IV-D-33

April 15, 1981

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SECTION

Docket A-79-25
Environmental Protection Agency
Central Docket Section
West Tower Lobby
401 M Street S.W.
Washington, D.C. 20460

Dear EPA Officials:

The proposed radioactive waste that is to be transferred from Canonsburg and dumped in our area is very alarming and of much concern to us and our family.

The people in Burgettstown Boro, Hanover, Smith, and Jefferson Townships in Washington County, Penna. are combining forces with Hancock and Brooke Counties in West Virginia to fight to the very end to keep this from taking place.

We do not want this waste. We already have a questionable clean-up site for a chloroform spill that took place in Midway, Penna. last summer located on the outskirts of Burgettstown within a half mile of our Junior-Senior High School. The underhanded methods used by all those involved in setting up this site leave the residents with much distrust of governmental agencies and their officials. To add insult to injury, the chloroform clean-up operation was to have been completed by December 1980, but as of today's date is still an on-going project!

If this radioactive waste dump is forced upon us by the DER and DOE (as the above clean-up was), what will prevent this from happening again and again until the whole area is a vast wasteland of dumps.

We request that any plans for transferral of hazardous waste from one area of Washington County to another be dropped and other alternatives considered.

Sincerely,

Mr. & Mrs. J. Wm. Hemphill
11 Hindman Ave.
Burgettstown, Pa. 15021
(Washington County) 412-947-4764

P-8

A-79-25
IV-D 82

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JUN 2 1981
CENTRAL DOCKET

Submitted by
Marie Pnazek
2208 Knob Creek Rd.
Johnson City, Tenn.
37601
April 26, 1981

I wish to commend director and staff of EPA project for preparing standards "For Remedial Action for Inactive Uranium Sites (40-CFR-192)", that clear, concise, and the ideas, arguments, presented in logical form. This document gives information about state-of-the-art to solve problems posed by uranium mill tailings and other toxic elements found in the pile which may pose a radiation health hazard to the public. The recognition that transport by groundwater most likely means by which radionuclides may reach the biosphere is significant, but the means, that is, liners, clay or acid leaching to minimize contamination, in my opinion, are woefully inadequate.

I would like to offer suggestion based not on mining experience, scientific or technical expertise, but as concerned Senior citizen, who listens to lectures, and reads articles about the by-product of our industrial society, "garbage". These wastes cannot decompose, or recycled and technology not develpoed to contain wastes safely. After reading Item no. 4.8.3, page 4-36, section on "Toxicity of Major Toxic Substances Found in Tailings", the last word on the page is "sulfate". Immediately, I remembered that graphite brick was made in 1940 by E. Fermi and his group to slow down neutrons in an experiment at Univ. of Chicago. Also, in recent article there was reference to some uranium deposit in coal mines. My question is, whether it would be possible to use hard coal, anthracite, which contains very little moisture, to control effectively radioactivity. If, so, the hard rock could be formed as a cover for piles to retard radon gas and other particulate matter from escaping into the air. To contain migration of radionuclides into the soil and water the hard coal could be used as underlining, but it might be necessary to shoft the pile, and use other means as terracing slope, and digging trenches around flat land to be filed with coal. Another "dead material", fossils, petrified rock might be useful for this purpose.

Fortunately, hard coal deposits are located in Western states where many of the uranium piles are located. It would be less hazardous to move the coal from the mines to the inactive processing sites, than vice-versa.

There are two minor clerical errors on the following pages that should be deleted, that is, 7-2, line 12, and 7-8, line 5.

Thank you for the opportunity to comment on this important subject.

Marie Pnazek

A-79-25
IV-D-36

CHARLES R. BUTLER
GEOLOGIST
P. O. BOX 438
DURANGO, COLORADO 81301

WEST BUILDING

PHONE 24

RECEIVED
ENVIRONMENTAL PROTECTION
AGENCY
MAY 06 1981
CENTRAL DOCKET
SECTION

April 28, 1981

U.S. Environmental Protection Agency
Docket No. A-79-25
West Tower, Gallery 1, 401 M Street, S.W.
Washington, D.C. 20460

Re: Comment on Proposed Cleanup and
Disposal Standards for Inactive
Uranium Processing Sites

Dear Sirs,

I have reviewed Parts IV, V and VI of the EPA proposals for cleanup and disposal standards relating to inactive uranium processing sites. In my opinion the proposed standards are too stringent and inflexible to allow the intent of PL 95-604 to be accomplished at reasonable costs.

With respect to Parts IV and V which relate to cleanup of inactive sites, I recommend that the standard of 5 pCi/gm be increased and made subject to greater flexibility.

For example, in the Durango area, Ford, Bacon and Davis (Nov. 1977) recommended that 24 inches of top soil be removed from the raffinate ponds area. In view of the fact that most of the contaminants in the ponds area have already been covered with several feet of overburden, the proposal to remove 24 inches of soil defies logic. The available cover materials adjacent to the raffinate area have a higher emission rate than the average surface soils at the raffinate area.

Utilizing the proposed standards, I presume that DOE would drill a series of holes to determine the concentration of radium 226 in the subsurface. A determination of radium concentrations attributable to mill residues represents a complex if not impossible problem to the DOE or its contractor especially in view of the fact that the residues are mixed with natural soils that in many instances contain radium 226 in excess of 5 piC/g.

The standards should provide sufficient flexibility so that selective areas of contamination can be defined and the contaminants removed. A series of monitor holes between the Animas River and the raffinate area could be utilized to determine the degree of ground water contamination, and a sensible decision could then be made as to the type of remedial action program which

will provide long term protection to the public. The proposed standards may provide DOE with no option other than removal of a ten or more feet of material from the entire raffinate area at a cost of several million dollars. If fill material were derived from the adjacent hillside, the resulting radon and gamma emission rates would probably be higher than the pre-project rates.

Part VI requires that ground waters not be contaminated beyond .1 Km from the buried pile. There may be instances where a planned gradual release of soluble minerals over a long period of time would make more sense than a zero discharge long term impoundment of the toxic and radioactive substances. Sensible criteria for shale or clay or other types of insoluble liners should be sufficient for the protection of ground water. A drinking water or no degradation standard should be sufficiently flexible that a non-aquifer medium of containment such as a shale formation not be subject to a .1 or a 1 Km distance requirement.

I trust these comments are helpful in arriving at sensible standards for cleanup and disposal of the uranium tailings at reasonable costs.

Very truly yours,

Charles R. Butler

Charles R. Butler

CRB/n

A-79-25
IV-D-35

Sir

In regard to the pollution in Conons burg

Why move the trash from one place & put it some other place. This pollution should not have been put there in the first place. With all this pollution going into the environment every day how are we going to live.

I'm 35 years old, I'm worried about my to sons and my grand children

We are going to have to find other ways to produce power and stop all pollution. The only way to stop it is to eliminate it at the source.

There is hydro & solar power, even wind power but the nuclear power has to be stopped.

The nuclear waste can't be handled so there is one reason to go to something else.

The standards you are setting are to high. my family + I want NO Pollution

after we screw the world up there isn't any other world for us 2 go. We have the air polluted and even the oceans 78% of the world polluted

Stop it

Robert J Kushlane
Box 164
Cuddy Pa
13031

P-10

Text of hand written letter received 12/16/81 from Robert J Kuchena of Cuddy, Pa.

(Page 1)

Sir:

In reguard (sic) to the pollution in Canonsburg.

Why move this trash from one place & put it some other place. This pollution should not have been put there in the first place. With all this pollution going into the environment every day how are we going to live.

I'm 35 years old, I'm worried about my to (sic) sons and my grandchildren.

(Page 2)

We are going to have to find other ways to produce power and stop all pollution. The only way to stop it is to eliminate it at the source.

There is hydro & solar power, even wind power but this nuclear power has to

(Page 3)

be stopped.

The nuclear waste can't be handled so there is one reason to go to some thing else.

The standards you are setting are to (sic) high. My family & I want NO Pollution.

(Page 4)

After we screw this world up there isn't any other world for us to go. We have the air polluted and even the oceans 78% of the world polluted. Stop it

Robert J. Kuchena
Box 164
Cuddy, Pa 15031

P-11

A-79-25
II-D-57

Technical Information Project
P. O. Box 602
Mandan, North Dakota 58554
May 6, 1981

Docket No. A-79-25
U. S. Environmental Protection Agency
Central Docket Section
West Tower Lobby
401 M Street SW
Washington, D. C. 20460

RECEIVED
ENVIRONMENTAL PROTECTION AGENCY
MAY 21 1981
CENTRAL DOCKET SECTION

Dear Sir/Madam:

This letter is to comment on EPA's proposals for cleanup and disposal standards for inactive uranium processing sites (40 CFR Part 192). Our comments are centered around the following points:

(1) A lack of consideration of the uptake and concentration of radioactive and toxic elements by plants was evident in the Draft Environmental Impact Statement for Remedial Action Standards of Inactive Uranium Processing Sites (EPA 520/4-80-011) and is reflected in the proposed standards. Considerable scientific evidence points to the problem of uptake by plants of radioactive elements (Athalye and Mistry, 1972; D'Souza and Mistry, 1970; Moffet and Tellier, 1977; Morishima et al., 1977) and subsequent contamination of the food chain (Garner, 1972). In North Dakota a serious case of molybdenosis in range-fed beef cattle resulted from vegetation growing near a waste site of a past uranium processing facility. Selenium poisoning is also of concern.

Our concern in this area is heightened by recent reports from studies in coal mine reclamation work (Power et al., 1979; Merrill et al., 1980) which show that upward migration of salts (and perhaps toxic elements) occurs in semi-arid and arid regions. This upward migration would eventually make buried waste available to plants. If this occurs with the uranium mill tails in this program the stricture that "the remdial action should be done right the first time" (HR Rep. No. 1480, 95th Cong., 2nd Sess., page 40 (1978)) will have been violated.

(2) Given the admonition that "no disposal method has been tested sufficiently to establish its practicality or effectiveness over long periods of time" (46 FR 2558), the lack of a requirement for detailed background analysis at any new disposal site and for strict, long-term monitoring following remedial disposal is unacceptable. We believe that a pre- and post-disposal analysis and monitoring must include (a) an assessment of alpha, beta and gamma radiation in ambient air at the disposal site on a daily basis; (b) daily assessment of radon-222 concentrations in ambient air; (c) weekly assessment of surface waters within

1000 meters of the disposal site for total radioactivity and for concentrations of radioactive and toxic elements; (d) monthly assessment of groundwater from samples taken at the site and at various distances from the site for radioactive and toxic elements; (e) monthly assessment of soil cores for radioactive and toxic elements; (f) monthly assessment of above- and below-ground portions of the vegetation at the disposal site and at various distances from the site for radioactive and toxic elements; (g) monthly assessment of the domestic animals and animal products from adjacent farms or ranches for radioactive and toxic elements; (H) quarterly assessment of small mammals within 1000 meters of the disposal site for radioactive and toxic elements; (i) annual assessment of the radiological status of the human population living within 30 kilometers of the proposed disposal site.

(3) The indoor gamma radiation standard of 0.02 mR/hr would exceed the average annual outdoor background dose by 100%. For health reasons this should be lowered.

(4) In areas where water shortages are a common occurance the policy toward protecting groundwater must be no degradation of the groundwater. This standard uses the background characteristics of the groundwater as the yardstick by which future pollution is measured. Operationally this standard requires numerous and frequent sampling of the groundwater to assure compliance. Additionally pre- and post-disposal sampling must be coordianted to allow for a scientifically controlled and statistically valid methodology.

The Technical Information Project appreciates this opportunity to comment. Please keep us informed of developments on these standards.

Sincerely,

Donald Pay

Donald Pay

REFFERENCES USED IN THIS LETTER

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PAGE 1

A 79-25
IV-D-41

May 6, 1981

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Docket No. A-79-25
Environmental Protection Agency
Central Docket Section
West Tower Lobby
401 M Street S.W.
Washington, D.C. 20460

TO WHOM IT MAY CONCERN:

This is to comment on the possible transfer of uranium mill tailings from the Canonsburg and Burrell Township sites in Washington County, Penna, to either the Dinsmore or Ash Dump Sites also in Washington County, Penna.

We protest the possibility of having a tailings disposal site in our area for the following reasons:

HEALTH AND SAFETY HAZARDS

1.) The long term effects of low level radiation are unknown and of much controversy even among medical and scientific experts. There is no guarantee that the tailings would not be a threat to the lives of us and to future generations.

2.) Land around the proposed sites is much too porous and shifting rock strata from mine blasting could well permit movement of radioactive particles.

3.) The proposed sites are in the watershed of the Smith Township Municipal Water Authority with the possibility of water-supply contamination, and also near at least two elementary schools: Hanover and Collier.

4.) Health studies of the population around the proposed sites have not been conducted to determine the existing cancer rate or the current exposure to radiation or hazardous elements in the environment. Additional exposure to radiation from the tailings may then exceed so-called "safe limits".

5.) Transporting the tailings would be a large scale undertaking which would expose both workers and the general public to health and safety hazards, such as Radon 222 exposure and truck or rail accidents.

ECONOMIC HAZARDS

1.) Property would be devaluated. (Who would want to buy a home near a radioactive waste dump?)

2.) Transportation of the uranium tailings could prove to be tremendously expensive to local taxpayers if no guarantee is made to cover the cost of highway destruction or damage to health and property as a result of truck or rail traffic and accidents.

3.) Contamination of the water supply would be very costly to the Smith Township Municipal Water Authority and its customers.

(Continued)

4.) It will cost taxpayers millions of dollars more to transfer the tailings to the Dinsmore or Ash Dump Sites than it would to stabilize them at Canonsburg.

HEALTH, SAFETY, AND ECONOMIC HAZARDS

1.) There are no guarantees that properties adjacent to the Dinsmore and Ash Dump Sites would not be used also for future hazardous waste dumping, escalating all of the previously listed hazards.

For all of the above reasons and the statements in the Federal Register, Part VI, dated January 9, 1981 - Environmental Protection Agency - Proposed Disposal Standards for Inactive Uranium Processing Sites; Proposed Rule and Extension of Comment Period:

> "Although several States and the NRC have begun regulating tailings at active mills, no disposal method has been tested sufficiently to establish its practicality or effectiveness over long periods of time." (Pg. 2558)

> "Disposal of tailings piles from inactive processing facilities is a large scale undertaking for which there is very little experience." (Pg. 2561).

We believe that the proposal to transfer uranium mill tailings to a disposal site in our area be dropped and stabilization in place be the method adopted for correcting the situation.

Sincerely,

J. William Hemphill
Carole G. Hemphill

Mr. & Mrs. J. Wm. Hemphill
11 Hindman Ave.
Burgettstown, PA 15021

P-13

A-79-25

IV-D-48

9 Hindman Avenue
Burgettstown, PA 15021
May 7, 1981

Docket A-79-25
Environmental Protection Agency
Central Docket Section
West Tower Lobby
401 M Street S.W.
Washington, D.C. 20460

RECEIVED
ENVIRONMENTAL PROTECTION
AGENCY
MAY 1 5 1981
CENTRAL DOCKET
SECTION

Dear Sir:

Recently it has come to the attention of our community of Burgettstown, Washington County, PA that the Federal Government is considering dumping residual radioactive uranium from the inactive uranium processing site at Canonsburg, PA and Blairsville, PA to the Ash and Dinsmore sites in Hanover Township.

I am very much against this as both sites are located in the middle of a watershed area and near a very populated area. We understand that the ground is very porous in that area which could result in contaminates leeching away from your choosen site.

This is a coal mining area and a lot of blasting is done and I wonder what will happen in the long run to any site you might construct. Further there are serious complications involved in transporting this waste. Do you realize that with 80 thousand tons of waste from Blairsville and 200 to 500 thousand tons from Canonsburg, it would take 420 trucks per week running simultaneously for 19 weeks travelling over bad roads and through our communities to finish the job? Please think of the potential for accidents and the radioactive dust that could be distributed while loading, travelling from one site to another and unloading.

Rail shipment is not feasible as the tracks have not been kept in good shape and a spur would have to be built at the unloading site.

It is surprising to me that our government is in the business of creating new contaminated sites. There was one in Canonsburg which was moved to Blairsville and now you want to move it again to create a third site.

Please take the time to make a responsible decision in this matter and have the present site modified, treat the waste in some manner or transport it to existing sites such as are located in Hanford, Washington. Please think of the people of Burgettstown, of our children and of our children's children. Lets not put the people in any potential jeopardy.

Burgettstown may be a small town community but our spirit is very large and we will remain adamant on this issue.

Sincerely,

Joyce Hemphill Miller
Joyce Hemphill Miller

JHM:ajm

P-14

A-79-25

IV-D-50

Route 3, Box 115-D
Las Cruces, NM 88001
7 May 1981

U.S. Environmental Protection Agency
Docket No. A-79-25
West Tower, Gallery 1
401 M Street
Washington, DC 20460

RECEIVED
ENVIRONMENTAL PROTECTION
AGENCY
MAY 21 1981
CENTRAL DOCKET
SECTION

Ladies and Gentlemen:

The proposed interim cleanup standards for inactive uranium processing sites are meaningless because they assume that BEIR standards provide adequate radiation protection and that cleanup technology is available. Further, the first sentence of Section 192.21(d) is a self-destruct button which cancels the rest of the proposed cleanup standards.

Enacting these standards into law will give the public a false sense of security, load the books with more useless legislation and create the impression that the Environmental Protection Agency has done something to protect the environment.

BEIR standards. The National Academy of Sciences' Committee on the Biological Effects of Ionizing Radiation — like every other august body that has arrogated unto itself the right to tell us how much radiation we may legally absorb — has a unique up-side-down method for setting standards. If a manufacturer builds an airplane designed to fly at mach-2, the plane is flown many times through increasingly tougher tests before it is taken through the sound barrier. Radiation wizards choose to start with the highest imaginable "safe" dose, then defend their "standard" tooth and nail until someone establishes beyond question that it is causing great numbers to fall over dead.

In 1954 the National Council on Radiation Protection and Measurements told Congress that 36 rads per year was a reasonable limit for public exposure. In 1955 the annual limit for worker exposure finally was reduced from 1000 rads to 25 rads. As late as 1961 the scientific advisors to government agencies concerned with civil defense concluded that an individual could withstand 200 rads over a few days and 1000 rads in a year. Though the onus should be on the regulators to prove that a standard is safe, it is left to the regulated to prove it unsafe.

One would have a difficult time selling BEIR standards to the likes of Arthur Tamplin, John Gofman, Alice Stewart, Thomas Mancuso, Morris DeGroot, Irving Bross, Brian McMahon or Ernest Sternglass — all of them respected scientists, though not necessarily universally beloved. The EPA would so well to heed Freeman Dyson; when Sternglass wrote a letter critical of a

Dyson article in the Bulletin of Atomic Scientists, Dyson replied (in the bulletin):

> I welcome this chance to call attention to Ernest Sternglass' article "Infant Mortality and Nuclear Tests" in the April Bulletin. I urge everyone to read it. Compared with the issues Sternglass has raised, my arguments are quite insignificant.
>
> Sternglass displays evidence that the effect of fallout in killing babies is about a hundred times greater than has been generally supposed. The evidence is not sufficient to prove Sternglass is right. The essential point is that Sternglass may be right. . . . .

There is no maximum amount of garbage which a neighbor may throw in my yard, whether it comes from his kitchen refuse or creeps invisibly from his mill tailings.

Cleanup technology. The DOE estimates that all mill tailings could be cleaned up for about $150 million, but it did not say what it was smoking when it arrived at that figure. NRC's estimate for a "model mill" is $322,000 to $26,240,000 with a possible cost of $136,590,000 if departures from current technology are considered. But departures from current technology must be considered. The GAO says, reasonably effective means of wind and water erosion control are available, although they will involve continued maintenance costs." Does anyone think that continued maintenance over the toxic life of the tailings is reasonable? The best GAO can say for control of leaching is that "possible methods exist."

The State of New Mexico Environmental Improvement Division proposes that mill tailings be covered with three meters of earth with vegetation on top. However, soluble sulphate salts in the tailings together with dry conditions at the surface would cause an upward flux that would bring radioactive materials to the surface in a matter of months. The salts would kill vegetation on the surface, thus allowing wind and water erosion to go back to work. I suppose that if you could find enough barium in the country, it could be used to eliminate sulphuric acid from the waste before drying, but then EPA would have to write cleanup standards for inactive barium mines.

One suggested method is an asphalt seal covered with an asphalt emulsion covered with earth covered with vegetation treated with herbicides to prevent penetration of the seal by the roots. So far no one has offered to install such a system with a 10,000-year warantee.

Scrubbing and washing might reduce radioactivity on most structural surfaces, though with some hazard to the workers. There is no technique which can effectively decontaminate open land and vegetation.

What will work? There is one course which might stabilize the problem if not the tailings. Until guaranteed cleanup technology is invented, we could halt the mining of uranium except in quantities sufficient for medical and research requirements.

This system, of course, would require some adjustments in electric power generation and weapons manufacture. As to electricity, the sooner we make the adjustment, the easier it will be. The weapons matter offers a marvelous opportunity for conservation. Between them, United States and Russia have enough nuclear weapons to deliver the equivalent of four tons of TNT to every man, woman and child on earth. Now if everyone will give up two tons of his share, it will not be necessary to build any new bombs until the population of the earth doubles.

Environmentalists are the last realists.

Sincerely

Edward B Burns

Edward B. Burns

P-15

A-79-25
IV-D-53

4459 Kilmer Drive
Murrysville, PA 15668
May 8, 1981

RECEIVED
ENVIRONMENTAL PROTECTION
AGENCY
MAY 29 1981
CENTRAL DOCKET
SECTION

ENVIRONMENTAL PROTECTION AGENCY
401 M Street SW
Washington, DC 20460

Gentlemen:

In reference to the material covered in Docket A-79-25, it is my understanding that the EPA proposes to regulate radon emissions based upon their point of origin and not by their health impact. I consider this approach to be bigoted, highly discriminatory and inconsistent with the intent of Congress in forming the EPA. Release of a material to the environment may have a significant health impact, and it is your responsibility to make that determination. It is not your privilege to say that radon from one source is unsatisfactory (bad radon), but from another source the identical radon is satisfactory (good radon).

The Food and Drug Administration does not determine the health effect of a food material based upon where it was grown nor does it base a drug's safety on whether it was derived in nature or synthesized by a drug manufacturer. An extension of your approach would do just the opposite. Your approach to the regulation of radon emissions is unscientific, illogical and a dangerous precedent if enacted. Therefore, I protest this approach and urge you to redefine allowable radon emissions based upon the normal approach of concentrations and quantities.

Very truly yours,

William G. Tope P.E.

William G. Tope
Professional Engineer

cc: Rep. Don Bailey

P-16

A-79-25
IV-D-39

Docket A-79-25
Environmental Protection Agency
Central Docket Section
West Tower Lobby
401 M. Street S.W.
Washington, D.C. 20460

RECEIVED
ENVIRONMENTAL PROTECTION
AGENCY
MAY 08 1981
CENTRAL DOCKET
SECTION

Gentlemen:

I am writing as a very concerned citizen about the proposed dumping of radioactive waste in our area.

I realize how very removed you are from the scene so therefore have no realization of what such a move would do to our Smith Township - Washington County *water* supply. The proposed sight to the planned dump is very close to the *Dam* which supplies us with water. Have you considered what that would do to our communities?

Come out of your "Ivory Towers" gentlemen and see what *you could cause* before you make these decisions of dumping the waste in our area.

We maybe "hicks out in the sticks" *But* we are taxpayers who do not intend to be "dumped on"

P-16

without letting our officials know exactly how we feel, about your roll in supposedly wanting to "protect" people.

Now's the time to show us how you back up your rhetoric

Thanking you, I remain,
Very truly yours,
Miss Elvira Gonzalez
404 Fourth Ave.
Langeloth, Pa. 15054

P-17

Natural Resources Defense Council, Inc.
25 KEARNY STREET
SAN FRANCISCO, CALIFORNIA 94108
415 421-6561

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A-79-25
II-D-61

May 8, 1981

Dr. William A. Mills, Director
Criteria and Standards Division
Office of Radiation Programs
U.S. Environmental Protection Agency
West Tower Gallery 1
401 M Street, S.W.
Washington DC 20460

RE: Comments on Draft Environmental Impact Statement for Remedial Action Standards for Inactive Uranium Processing Sites (40 C.F.R. 192), December 1980, EPA 520/4-80-011, and Accompanying Proposed Standards, 46 Fed. Reg. 2556, January 9, 1981

Dear Dr. Mills:

Enclosed are the comments of the Natural Resources Defense Council (NRDC) and the Southwest Research and Information Center (SWRIC) on the above-referenced draft environmental impact statement and accompanying proposed standards. NRDC and SWRIC are both public interest environmental organizations with long-standing commitments to protecting the public from the hazards of uranium mining and milling.

We believe that implementation of the proposed standards will go a long way towards ensuring that disposal and clean-up of inactive uranium mill tailings sites will be adequate to protect the public from future exposures to radioactivity. However, as explained in detail in our comments, the draft statement and proposed standards omit consideration of critical regulatory and technical issues. In addition, they fail to discuss adequately many of those issues that are addressed.

These fundamental flaws can only be rectified by preparation and circulation of a new draft statement and supplementary proposed regulations.

Sincerely,

Lisa Gollin
Lisa Gollin
NRDC

Georgia Yuan
Georgia Yuan
NRDC

Paul Robinson
Paul Robinson
SWRIC

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RECEIVED
CRITERIA & STANDARDS DIVISION, ORP
DATE: MAY 20 1981

Natural Resources Defense Council, Inc.
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SUITE 600
WASHINGTON, D.C. 20006
202 223-8210

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122 EAST 42ND STREET
NEW YORK, N.Y. 10168
212 949-0049

COMMENTS OF THE NATURAL RESOURCES DEFENSE COUNCIL AND THE SOUTHWEST RESEARCH AND INFORMATION CENTER ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR REMEDIAL ACTION STANDARDS FOR INACTIVE URANIUM PROCESSING SITES (40 CFR 192)(EPA 520/4-80-011) AND ACCOMPANYING PROPOSED STANDARDS

46 FED. REG. 2556, (JANUARY 9, 1981)

Submitted by:

Lisa Gollin--NRDC
Paul Robinson--SWRIC
Georgia Yuan--NRDC

May 8, 1981

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I. INTRODUCTION

The Natural Resources Defense Council and the Southwest Research and Information Center submit the following comments on the Draft Environmental Impact Statement for Remedial Action Standards for Inactive Uranium Processing Sites (40 C.F.R. 192) EPA 520/4-80-011 (DEIS) and on the accompanying standards (46 Fed. Reg. 2556) prepared by the Environmental Protection Agency (EPA). The DEIS and proposed standards have been issued in response to the Uranium Mill Tailings Radiation Control Act of 1978 42 U.S.C. §7901, et seq. (UMTRCA). UMTRCA, inter alia, requires the EPA to "promulgate standards of general application ... for the protection of the public health, safety, and the environment from radiological and non-radiological hazards associated with residual radioactive materials ... located at inactive uranium mill tailings sites and depository sites ... ."[1/]

Although we are pleased with the progress signaled by the issuance of these proposed standards and this DEIS, we are compelled to note that the statutory deadline for promulgation of these standards passed almost two years ago. Furthermore, although we believe that implementation of these standards will go a long way towards ensuring adequate protection of the public, we urge EPA to supplement the standards to cover a broader range of health hazards. Even though EPA took

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[1/] UMTRCA §275(a).

substantial time to complete its mandate, the proposed standards are too narrow and this long-awaited DEIS is unsatisfactory.

The impact statement fails to meet the requirements of the National Environmental Policy Act, 42 U.S.C. 4321-4347 (NEPA), in two fundamental respects. The discussion of the proposed standards is superficial and incomplete. The DEIS does not provide adequate information for choosing the proposed standards nor does it provide a well-reasoned rationale for their selection. Additionally, the DEIS fails to discuss all the health effects of uranium mill tailings. The limited treatment of health effects in the DEIS hampers EPA's ability to promulgate all the necessary health protection standards.

The proposed standards reflect the deficiencies of the DEIS and fall short of the statutory mandate of UMTRCA. EPA fails to address occupational safety, non-radiological contamination of soils, surface and ground water which has already been contaminated and protection of the general population in the interim period before remedial action is completed.

Inactive uranium mill tailings sites have long been recognized as health hazards and EPA must act expeditiously so that remedial action can begin. However, we believe that EPA must prepare a new DEIS in order to correct the fundamental deficiencies we identify below. Until a revised and

substantially improved DEIS has been prepared, there is insufficient basis for promulgating the protection standards mandated by Congress. The standards which EPA has proposed must be supplemented in order to properly guide the remedial action so that this decades old problem will finally be solved. Finally, EPA should also provide another opportunity for public comment of a revised impact statement and supplemented proposed standards.

II. THE DEIS DOES NOT MEET THE SUBSTANTIVE REQUIREMENTS OF NEPA

A. The DEIS Fails to Provide an Adequate Basis for Selection of the Proposed Standards.

The DEIS is consistent in its failure to present meaningful analysis of its proposed standards. This failure has limited EPA's view of its Congressional mandate. EPA did not propose occupational safety standards, ground and surface water clean-up standards, or standards for the time period before remedial action is completed. *See* Sections II.B.4, III.B., and IV.D. below for more detailed discussion.

Moreover, the rationale for selecting the proposed standards is unclear. Whether one looks at the indoor radon standards or water contamination standards, EPA's treatment is the same. Three different alternatives are presented: a moderate alternative and two extremes. The DEIS then summarily disposes of the two extreme alternatives and ends its analysis.

In short, EPA provides no substantive analysis of its standards in this DEIS. Although we feel that the proposed standards will in large part protect public health after disposal and clean-up are completed, EPA has not provided a basis for choosing these standards in the DEIS.

The DEIS discussion of the radon standard for tailings disposal illustrates EPA's superficial treatment of the proposed standards. The radon standard specifies the type of measurement required -- dose, total release rate, or release rate per unit area -- and sets a numerical limit on radon emissions. The DEIS rejects both a dose standard and a total radon release rate standard in two brief paragraphs DEIS, p. 8-4, 8-5. The rejections are not well supported and consist of conclusory statements:

> "We rejected a dose or exposure standard. It is cumbersome to implement, with no compensating advantages except that it relates directly to risk. ... We also rejected a standard based on the total radon release rate. Limiting the total radon release rate fails to take account of the great differences in radioactivity among the piles." Id.

The choice of specific numerical limits is also not well supported and relies only on the rejection of extreme cases:

> "We considered setting a higher or lower radon release standard. Higher levels, from 10 to 40 pCi/m^2-sec, perhaps, appear unjustified. ... We also find near total control of radon release from the tailings unjustified. Incremental costs for achieving emission rates lower than 2 pCi/m^2-sec rise faster than emissions drop, and any achievable health benefits would be extremely expensive." DEIS, p. 8-6, 8-7.

It appears from these discussions that EPA is relying more on intuition than on actual analysis. We believe that in order for this DEIS to meet the substantive requirements of NEPA, the discussion of the standards must include a systematic comparison of at least the costs, health impacts and likely disposal options which would result from implementation of the proposed standard and a higher and lower alternative. In addition, the DEIS should discuss a similar range of limits for each type of standard, i.e., dose, total radon release rate, and release rate per unit area. Until such an analysis has been completed, EPA has not provided an adequate basis for setting its standards and has effectively shirked its responsibilities to consider reasonable alternatives in this DEIS.

B. The DEIS Fails to Provide Adequate Analysis of Health Hazards

1. Acknowledged health risks were not addressed.

The health effects from exposure to both radiological and non-radiological components of mill tailings are poorly documented. Radiological health effects, in particular, are very difficult to calculate with a high degree of certainty. A recent U.S. General Accounting Office report points to the limited number of human exposure cases available for study and the uncertain relationship of animal studies to human situations as two reasons for the continued lack of empirical data on radiological effects.[2/]

However, radiological health effects, although not easily correlated with specific dose levels, are acknowledged in previous studies and include leukemia, lung cancer, bone cancer, and genetic defects. Even though the rate of leukemia death is reported to be twice the State average in Mesa County, Colorado (the location of the Grand Junction inactive site),[3/] the DEIS considered only lung cancer in its discussion of health effects. The limited view of health effects in the DEIS resulted in narrowing the types of standards proposed by EPA. For example, the emphasis on controlling radon daughter products evident in the proposed standards clearly reflects the DEIS discussion of lung cancer to the exclusion of other health effects.

In addition, EPA failed to recognize the need to consider health effects for all non-radiologic components of the tailings. As discussed in our comments below, EPA only

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[2/] U.S. General Accounting Office, "Problems in Assessing the Cancer Risks of Low-Level Ionizing Radiation Exposure," EMD-81-1, January 1981, Vol. 2, p. 2-33.

[3/] U.S. Nuclear Regulatory Commission, Excess Cancer Incidence in Mesa County, Colorado, NUREG/CR-0635, July 1979, p. 17.

included six of ten identified mobile substances in its ground water standard. See below, Section III.C. The decision to base the ground water standard on National Interim Primary Drinking Water Regulations was made after a cursory consideration of health impacts. DEIS, p. 4-36. A thorough consideration of health impacts is required by NEPA, and equally important is a necessary basis for promulgation of adequate protection standards.

2. The statistical analysis of health effects in the DEIS does not take into account population increases.

The DEIS estimate of radiological health hazards utilized 1970 population figures, even though population increases have been significant near some sites. For example, 1980 census figures for Salt Lake County reveal a 26% increase since 1970.[4/] The DEIS assertedly ignores population changes when analyzing the effects on local and regional populations from radon decay products. DEIS, p. 4-13. In addition, the DEIS does not discuss the slow migration of the piles as they erode and cover larger areas potentially exposing people farther away from the site. The DEIS thus minimizes the health impacts from the tailings piles.

[4/] U.S. Bureau of the Census, 1980, Census of Population and Housing Advance Reports, PHC 80-V-46.

3. The DEIS fails totally to analyze the potentially significant food exposure pathway.

The DEIS only briefly mentions the food pathway. DEIS, p. 4-23, 4-26. The cursory and confusing treatment of this potentially significant pathway is wholly unsatisfactory. For example, the DEIS dismisses the food pathway by asserting that a scenario which assumes that the tailings are located in "a sparsely populated agricultural area based on cattle ranching ... maximizes the dose due to food," and is "inappropriate for many of the inactive sites." Id. However, EPA fails to discuss the many sites for which this setting is accurate. The inactive site located in Mexican Hat, Utah on the Navajo Reservation is currently used for grazing:

> "The current land use of the Mexican Hat area is grazing of sheep and cattle ... the pressure to use the tailings location [for buildings] is relatively low."[5]

The DEIS and the proposed standards must address the food pathway even if it may not be applicable to all inactive sites.

EPA's superficial treatment of the food pathway goes beyond the dismissal of grazing. Using data from the Nuclear Regulatory Commission's (NRC) draft environmental impact

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[5] Ford, Bacon & Davis Utah, Inc., "Phase II - Title I Engineering Assessment of Inactive Uranium Mill Tailings, Mexican Hat Site, Mexican Hat, Utah," GJT-3, March 31, 1977, p. 1-13.

statement on uranium milling,[6] EPA concludes that the risk due to ingestion of windblown tailings is less than one-tenth the risk from breathing radon decay products. DEIS, p. 4-26. However, the DEIS itself admits that the NRC analysis applies to few of the inactive sites. DEIS, p. 4-23. Yet EPA provides no better analysis of direct ingestion.

In addition, EPA failed to consider potential health hazards to fish. Although little research has been done in this area, effects of molybdenosis in grazing animals[7] and contaminated algae in rivers near active mills[8] indicate that local species are capable of concentrating radionuclides and other toxic elements. EPA must provide baseline information on fish, wildlife, and plants to remedy this significant deficiency of the DEIS.

EPA's failure to assess exposures to radioactivity received via the food pathway is inexcusable since EPA itself recognized the significance of this pathway in 1978. Dr. William B. Rowe, then EPA's Deputy Assistant Administrator for Radiation Programs, stated at a hearing before the Energy and Natural Resources Committee that further evaluation of the food exposure pathway was required because of the inadequacy of the [Department of Energy's (DOE)] Phase II reports.[9/] The "Phase II" studies were prepared for DOE between 1976 and 1978 and were intended to provide basic data on engineering solutions and costs for clean-up of eighteen inactive mill sites. In *each* Phase II study the food pathway was identified as one of the "major environmental routes of exposure to man," yet each study also admitted that "this pathway was not considered."[10/] EPA's omission of this pathway continues a pattern which threatens the satisfactory isolation of these uranium mill tailings.

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[6] U.S. Nuclear Regulatory Commission, Draft Generic Environmental Impact Statement on Uranium Milling, NUREG-0511, 1979, Volume II, Appendix G.

[7] Dollahite, J.W. et al., "Copper Deficiency and Molybdenosis Intoxication Associated With Grazing Near A Uranium Mine," The Southwest Veterinarian, Fall 1972, pp. 47-50.

[8] Landa, E., Isolation of Uranium Mill Tailings and Their Component Radionuclides From the Biosphere -- Some Earth Science Perspectives," U.S. Geological Survey Circular 814, 1980, p. 8.

[9/] Uranium Mill Site Restoration Act and Remedial Radioactive Materials Act, Hearings, Committee on Energy and Natural Resources, Senate July 24, 25, 1978.

[10/] *See*, for example, Ford, Bacon & Davis Utah, Inc., "Phase II-Title 1 Engineering Assessment of Inactive Uranium Mill Tailings Phillips/United Nuclear Site at Ambrosia Lake, New Mexico," GJT-13, December 1977, p. 1-7 to 1-8.

4. The DEIS does not adequately address occupational health hazards.

The DEIS devotes one brief paragraph to occupational health hazards, acknowledging that workers moving uranium tailings will be exposed to gamma radiation and radioactive airborne particulates, but concluding that "any occupational hazards will be temporary, and can be considered negligible compared to the long-term impact of uncontrolled tailings." DEIS, p. 6-10. Given the scale of the anticipated clean-up effort, this conclusion is wholly unsubstantiated and irresponsible. Whether the piles are buried or relocated, individual worker exposure will be significant. Furthermore, EPA's citing of a single study, covering one site, "in preparation" and unpublished, substitutes poorly for an informed discussion of worker safety. DEIS, p. 6-11.

The DEIS's treatment of occupational health hazards is indicative of the narrow view of the standards maintained by EPA. Since the standards are the basis of DOE's remedial action, occupational health hazards clearly have a significant effect on the types of measures proposed. In particular, *in situ* stabilization or removal of radium from the tailings might be favored if occupational exposure standards are applied during remedial action.

III. THE DEIS AND PROPOSED STANDARDS DO NOT ADEQUATELY ADDRESS CONTAMINATION OF WATER OR SOIL NEAR INACTIVE MILL SITES

A. EPA Has Failed to Provide Sufficient Information On Ground and Surface Water Contamination.

Admission of the need for surface and ground water research appeared as early as 1966, when the Department of Health, Education, and Welfare (HEW) called attention to elevated levels of radiation in surface water. Concerned about the cumulative and long-term effects of uranium milling in the Colorado River Basin, HEW recommended that:

> "... in view of the very long-lived nature of the radioactivity involved and the long-term poten*tial for pollution of Basin waters, discussions* be held and binding agreements be reached as soon as possible regarding long-term public and private responsibility for adequate maintenance of the tailings piles."11/

In 1974, EPA directly addressed the ground water issue, recognizing the need for more data and placing hope in the DOE Phase II studies of inactive mill tailings sites:

> "Although surface water has been extensively monitored, there are little or no data on the effects, if any, in ground water in the vicinity of certain piles where radiological contamination appears possible. Ground water studies of those locations should be conducted as part of the Phase II effort.12/

11/ U.S. Department of Health, Education, and Welfare, Disposition and Control of Uranium Mill Tailings Piles in the Colorado River Basin, March 1966, p. 8.

12/ U.S. Environmental Protection Agency, Summary Report of the Phase I Study of Inactive Uranium Mill Sites and Tailings Piles, 1974, p. 11.

The relevance and importance of such information was stressed again two years later in a 1976 EPA study:

> "Because of the extremely long period over which such wastes are toxic, it is fundamental that detailed ground-water monitoring data be able to determine and predict the extent of contamination. The stark contrast between a typical 20-year mill life and an 80,000-year half life for the dominant radionuclide (thorium-230) necessitates a much greater forward look than is now evident in waste disposal practices and preservation of ground-water quality."13/

However, subsequent EPA studies and DOE's Phase II reports have not adequately documented ground and surface water contamination and have simply repeatedly identified the need for further studies. Although the DEIS also acknowledges that ground water has been contaminated at some mill sites by both radioactive and non-radioactive toxic elements, DEIS, p. 3-6, 3-9, it fails to provide the essential data needed to assess the impacts of its proposed standards. In its brief discussion of this issue the DEIS admits that still:

> "Not enough information is available to estimate the chance that toxic substances from tailings will move through water and expose people to them. ... There has been no systematic study to establish the magnitude of ground water contamination for tailings at either active or inactive sites." DEIS, p. 4-34.

13/ Kaufmann, R., Eadie, G., Russell, C., "Effects of Uranium Mining and Milling on Ground Water in the Grants Mineral Belt, New Mexico," Ground Water, Vol. 14, No. 5, 1976, p. 307.

However, instead of conducting systematic studies, EPA merely observed that " ... under some conditions, ground water could become unusable over an area much larger than the pile." DEIS, p. S-5. EPA is obligated to take a long-term approach to the problem of ground water contamination. Contaminants are most certainly on their way to ground water resources, and EPA must set standards to protect both ground and surface water contamination.

The DEIS, in referencing Markos, 1979,[14/] suggests that surface water contamination may also be a greater concern than previously recognized. EPA, however, does not adequately address this issue. Instead, EPA merely states:

> "At present, it is unclear what methods, if any, may be needed specifically to avoid harm to the environment and public health from upwardly mobil: soluble contaminants." DEIS p. 5-10.

The referenced study, Markos, 1979, itself provides more information on the potential problems and indicates which methods of surface protection may not be adequate. Markos's work shows that deep cracks may form from the surface into the tailings and that vegetation can not be maintained easily since salts rise to the surface as long as a moisture gradient is

maintained from the interior of the pile outward. So as the surface dries, salts migrate outward, inhibiting plant growth at their roots. This would seem to indicate that vegetative and soil covers may be entirely inadequate to protect surface waters from contamination.

Thus, as a preliminary step in formulating standards to protect water resources already or now being contaminated, the EPA must complete the following studies:

(1) identify the problem through testing of water resources for both radiological and non-radiological contaminants, and

(2) present, explain, and apply more fully in the DEIS the recent studies which introduce new theories regarding the movement of soluble contaminants.[15/] These studies have a potentially critical impact on the methods used to prevent water contamination.

B. The Proposed Standards Do Not Adequately Address the Problem of Already Contaminated Surface and Ground Water.

As noted in the previous section, EPA studies confirm that ground water contamination has already occurred. In addition, DOE's Phase II reports, including those at Durango, Ambrosia Lake, Gunnison, and Grand Junction, indicate surface

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[14/] Markos, G., "Geochemical Mobility and Transfer of Contaminants in Uranium Mill Tailings," from Proceedings of the Second Symposium on Uranium Mill Tailings Management, Colorado State University, November 1979.

[15/] See discussion in DEIS p. 5-10.

water contamination in the vicinity of inactive tailings piles. In many instances, the level of contaminants, especially selenium, was found to be greatly in excess of the National Interim Primary Drinking Water Regulations, in one case as high as fourteen times the maximum allowable concentration of .01 mg/l.[16/]

The proposed standards fail, however, to supply any remedial action guidelines for contaminated ground and surface water. Regarding ground water, the DEIS states: "Where ground water contamination has already occurred, it may sometimes be possible to reduce it, but requiring remedial actions to satisfy pre-set standards in every case is not practical." DEIS, p. S-6. The "impracticality" of standards, however, is not substantiated. The DEIS fails to explore in any way the alternative of providing standards for ground water already contaminated by the tailings piles.

Similarly, the proposed standards fail to address completely surface water which has already been contaminated. The EPA standards prohibit only the increase of contaminant levels in surface waters from substances released from disposal sites. Consequently, the problems identified in numerous studies have not been addressed. Furthermore, the standards

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[16/] Ford, Bacon & Davis Utah, Inc., "Phase II-Title I Engineering Assessment of Inactive Uranium Mill Tailings, Durango Site, Durango, Colorado, GJT-6, November 1977, p. 3-15 (hereinafter Phase II Report, Durango, Colorado).

require clean-up only when the contamination occurs after disposal. We believe this requirement severely limits the mandated clean-up of the hazardous conditions caused by inactive tailings piles.

UMTRCA mandates EPA to prepare remedial action standards to correct the adverse impacts already caused by the tailings piles. The EPA proposed standards address the clean-up of ground and surface water summarily, ultimately rejecting the propagation of any clean-up standard at all. We urge EPA to meet its statutory mandate by adopting remedial standards applicable to already contaminated water resources.

C. The DEIS Does Not Adequately Assess the Toxicity of Non-Radioactive Contaminants in Surface and Ground Water.

The DEIS identifies ten toxic substances present in the tailings piles having a high probability of being mobile. DEIS p. 4-34. However, the proposed standards set maximum concentrations for only six of these substances based on the National Interim Primary Drinking Water Regulations. DEIS, p. 4-37 and Appendix D, p. 10. Maximum concentration levels for nickel, beryllium, vanadium, and zinc are not addressed, even though the Council on Environmental Quality has identified nickel, beryllium, zinc oxide, and zinc chloride as possible carcinogens and vanadium as an acute respiratory irritant and, if ingested, a producer of systemic symptoms.[17] Nor are any of these substances addressed in Appendix C of the DEIS which purports to cover "Toxicologies of Toxic Substances in Tailings."

These are critical omissions by the EPA, and a more thorough analysis of all the mobile and potentially toxic constituents of mill tailings must be included in its DEIS. We believe that relevant information supports setting a standard for all ten mobile elements.

D. THE DEIS Discussion of Soil Contamination is Inadequate Because It Fails to Address Non-Radiological Contaminants.

EPA bases its clean-up standards solely on the amount of radon detected in the soil, ignoring contamination from non-radiological elements. However, UMTRCA clearly mandates EPA to provide protective standards for radiological and non-radiological hazards associated with mill tailings.[18]

Numerous studies confirm the presence of non-radiological toxic elements in soil at inactive mill sites. For instance, at many sites vanadium was found in particularly high concentrations.[19] In addition, other mobile constituents,

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17/ Council on Environmental Quality, Environmental Quality, Seventh Annual Report, September 1976, p. 209.

18/ Uranium Mill Tailings Radiation Control Act of 1978, 42 U.S.C. §7901 *et seq.* (hereinafter UMTRCA).

19/ *E.g.*, Phase II Report, Durango, Colorado, p. 3-15.

such as cadmium and selenium, were often found.[20] Since these elements may enter the food chain by plant uptake and subsequent ingestion by wildlife or grazing animals, EPA should set a soil contamination standard. Such a standard would not only give guidance to the expected results of remedial action, but could aid DOE's determination of priorities by setting a limit as a basis for assessing the severity of contamination.

IV. THE PROPOSED STANDARDS DO NOT CONTAIN ADEQUATE MEASURES FOR IMMEDIATE PROTECTION OR FOR PROPER IMPLEMENTATION

A. EPA Should Promulgate Standards Aimed at Immediately Mitigating Hazardous Conditions in the Period Before Remedial Action.

An expedient solution to the mill tailings problem, unfortunately, is not in sight. After promulgation of the final standards, UMTRCA allows seven years for the completion of remedial action.[21] There is every reason to believe that this time period will be extended and that annual appropriations cannot be assumed. During these years, health hazards will not only continue, but will increase as populations grow, periods of individual human exposure lengthen, and more tailings are dispersed by wind and water erosion. To protect human health and the environment, the

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20/ Ford, Bacon & Davis Utah, Inc., "Phase II-Title I, Engineering Assessment of Inactive Uranium Mill Tailings, Riverton Site, Riverton, Wyoming," GJT-18, December 1977, p. 3-13.

21/ UMTRCA §112(a).

remedial action standards must address the immediate hazards as well as providing long-term clean-up and disposal standards. EPA should promulgate standards to address at least the following areas:

1. Airborne particulate control

Radioactive dust can be minimized by regularly spraying the piles with water or chemicals. In addition, this would minimize the migration of toxic contaminants to the surface. Standards should provide guidance on the frequency and method of application, as well as worker safety.

2. Effective isolation of the tailings piles

EPA remedial action standards should ensure that the tailings piles are effectively isolated. Besides the obvious health hazards of radon gas and gamma radiation, stagnant pools containing greatly elevated concentrations of radium and other toxics can be found near many of the sites.[22/] Consequently, the EPA should promulgate standards immediately requiring the construction of barriers, buffer zones, and posted warnings.

3. Grading of the piles to lessen erosion

Erosion of the tailings piles will continue to contaminate air, water, and soil during the interim period. Altering a pile's shape to control and isolate the travel of contaminants should be considered.

2/ See, for example, Ford, Bacon & Davis Utah, Inc., "Phase I-Title I Engineering Assessment of Inactive Uranium Mil Tailings, Grand Junction Site, Grand Junction, Colorado," JT-19, October 1977, p. 1-9.

B. The Proposed Standards Should Include Monitoring and Implementation Programs To Ensure Compliance After Remedial Efforts Are Completed.

It is evident from the DEIS that there is a high degree of uncertainty regarding both the extent of the hazards posed by the tailings and the effectiveness of the contemplated remedial actions. In light of this uncertainty and EPA's expectation that the remedial action standards will be met for at least one thousand years, 46 Fed. Reg. 2562 §192.03, we find the omission of a monitoring or implementation program inexcusable. EPA's superficial approach to meeting the standards is illustrated by the following discussion of disposal:

> "The longevity of any control method is difficult to quantify. Certain methods should last longer than others, but experience with all control methods is quite limited, especially considering the time that tailings will remain hazardous." DEIS, p. 6-8.

EPA's expectations for implementation appear to involve merely the utilization of mathematical models to calculate the expected release rate of a disposal system. We disagree that "Post-disposal monitoring can serve only a minor role in confirming that the standards are satisfied." 46 Fed. Reg. 2561.

DOE has seven years to complete the remedial action.[23/] Based on the current pace of DOE activity, it seems they will

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23/ UMTRCA §112(a).

take longer. Consequently, we believe EPA should actively monitor the disposal sites, until DOE has completed clean-up at all designated sites. We are not satisfied with the one-time application of a mathematical model to a recently completed disposal and clean-up activity. EPA must devise a mechanism for ensuring that the remedial action continues to meet its proposed standards at least one decade after the work is completed. A longer-term monitoring program is also essential to confirm that the disposal program has provided the expected degree of isolation under natural weathering and erosion.

Specifically, the monitoring program should include:

(1) Surface and sub-surface soil sampling for both radiological and non-radiological contaminants

(2) Gamma dose-rate measurements

(3) Radon surface flux measurements

(4) Vegetation monitoring
  a) Vegetation maintenance
  b) Analysis of vegetation for elevated levels of contaminants as a result of root uptake or surficial contamination of foliage by airborne particulates

(5) Ground water measurements for contamination

(6) Surface water measurements for contamination

(7) Maintenance of isolation barriers

(8) Aerial photography program to detect erosion patterns

Many of these mechanisms have been initiated by the Nuclear Regulatory Commission in its monitoring program for active

mills.[24] Certainly an equivalent oversight should be required by the EPA for inactive mill sites, especially in light of the clear Congressional mandate to supply standards for remedial action.

C. The DEIS Remedial Standard For Contaminated Buildings Should Be More Specific In Order To Aid Implementation.

The proposed standard fails to set any priorities for undertaking remedial actions based on the type and use of structures. The DEIS thus ignores the types of priorities established in the Atomic Energy Commission's Grand Junction Remedial Action Standards, 10 C.F.R. 12 (1972), which takes into account the type of structure, e.g., dwellings, schools, workplace; the magnitude of radiation; and the geographic location. By considerations of this type, EPA could effectively guide or determine the order in which structures are cleaned-up. In view of the potential funding problems this program may have in the future, we believe it is critical that EPA set priorities for clean-up of contaminated structures for DOE.

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[24] U.S. Nuclear Regulatory Commisson, Final Generic Environmental Impact Statement on Uranium Milling, NUREG-0706, September 1980, Vol. 1, p. 10-3.

V. CONCLUSIONS

In the comments above, we request many major revisions and conclude that these revisions can only be accomplished by issuing a new DEIS for circulation and public comment. Until an adequate EIS has been completed, the merits of the chosen standards are easily challenged and poorly supported.

The DEIS contains both formal and substantive deficiencies. First, the lack of formal analysis of alternatives is striking and disturbing. This fault, unfortunately, exists throughout the entire document. Secondly, information critical to the promulgation of the standards is missing. Additional information must be included in the areas of ground and surface water contamination, health hazard analysis, occupational safety, and protection of the food pathway.

Regarding the proposed standards, the omissions are even more critical. Standards aimed at the "protection of the public health, safety, and environment from the ... hazards associated with residual radioactive material" must cover activities *prior* to the remedial action, *during* the remedial action, and *after* the remedial action. We find that the proposed standards not only deal incompletely with the actual remedial action (*i.e.*, the absence of worker protection standards), but deal *not at all* with either prior or post-remedial action time periods. Immediate and temporary remedial action standards are needed, as are long-term monitoring

standards. Until EPA's proposed standards are expanded to encompass a *complete* remedial action program, the protection mandated by UMTRCA can not be accomplished.

A-79-25
IV-D-56

May 22, 1981
P.O. Box 445
El Prado, N.M. 87529

RECEIVED
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CENTRAL DOCKET
SECTION

William A. Mills, Director
Criteria & Standards Division
Office of Radiation Programs
U.S. EPA
Washington, D.C.

Dear Mr. Mills,

People here in New Mexico are greatly concerned about the health effects of mining and milling of uranium and we would appreciat a chance to comment on the DEIS on proposed remedial standards (40 CFR 192) for redisual radioactive materials and proposed EPA clean-up standards. The EID has only one copy and I had to xerox the heath section which I plan to give to concerned people, but it's no way to invite public comment. I would very much appreciate being put on your mailing list for any future opportunities to comment on these matters.

Also, you have a report called "Human Health Effects of Molybdenuain in Drinking Water", Chappel, W.R., et al, 1979,
US EPA Health Effects Research Lab Report
EPA-600 1/79 - 006. I wonder if I could possibly get my hands on this as it might solve the mystery of why we have had ten cattle die in the neighboring valley.

Thanks for your time and concern.

Sincerely,

Phaedra Greenwood

Phaedra Greenwood

Robley D. Evans
4621 East Crystal Lane
Scottsdale, Arizona 85253

May 27, 1981

Dr. William A. Mills, Director
Criteria and Standards Division (ANR-460)
Office of Radiation Programs
U. S. Environmental Protection Agency
Washington, D. C. 20460

Re: Remedial action for uranium processing sites (40CFR192)

Dear Bill:

Thanks for inviting my comments on several matters involved in EPA's proposed disposal and cleanup standards for Inactive Uranium Processing Sites (40CFR192) as published in FR 46, 2556-2563, January 9, 1981, (hereafter "FR81"), and in the EPA Criteria and Standards Division's Draft EIS for Remedial Action Standards for Inactive Uranium Processing Sites, EPA 520/4-80-011, December 1980, (hereafter "DEIS").

I do have several substantive constructive comments and a few minor ones to share with you.

Recall the remarks made concerning quite different health hazards by a water resource expert, Johns Hopkins' Professor Abel Wolman, in a 1960 JCAE hearing:

> "The development of criteria for the protection of health has invariably preceded full scientific understanding and acceptance... . The criteria have been eternally subject to reinterpretation, adjustment, and reframing as newer knowledge and experience were forthcoming."

My feeling is that there is sufficient new knowledge, not yet embodied in the DEIS or the FR81 to justify substantial adjustment of several of the standards proposed in FR81, paragraphs 192.12, and Tables A and B.

The Congressional mandate quoted in FR81 that "The Committee does not want to visit this problem again with additional aid. The remedial action must be done right the first time." does not commit the EPA to propose standards which are overly severe in the reduction of radiation levels which are already so low that they are small compared with fluctuations in the natural background radiation. Rather, the Committee could have been asking that the balance be "done right" between perceived risks, benefits, and costs.

The guiding principle probably is that exposures should be kept as low as is reasonably achievable, economic and social considerations being taken into account (ALARA). But where man-made exposures are significantly less than the variations in the natural background that has long been accepted as a normal fact of life, greatly increased expenditures of money and manpower, and possible serious harm to workers and the general public, in reducing the exposure further cannot be justified on any scientific basis.

RECEIVED
CRITERIA & STANDARDS DIVISION, ORP
DATE: JUN 8 1981

My constructive comments on 11 topics may be abstracted as follows. These abstracts are then followed by detailed discussion of each topic. I am sorry I didn't have time to write a shorter commentary.

ABSTRACT

1. Radon Flux and Dispersion.

Table 4-2 lists theoretical radon decay product working levels (WL) at distances downwind from a nominal uranium pile whose total annual radon flux is taken as 10,000 Ci. The slow growth of WL with elapsed time downwind is not recognized. The tabulated WL values can be converted to intended Rn concentrations vs. distance from the pile.

Carefully measured radon values reported elsewhere for the piles in Salt Lake City, Grand Junction, Monticello and Durango show that no radon from these piles can be detected at distances beyond 1/4 to 1/2 mile from the pile. The theoretical values of radon concentration are found to clearly exceed the true values as measured in the field, especially within the first mile.

The dispersion model overestimates the radon concentrations, and the incorrect assumption of 50% decay product equilibrium further enhances the overestimate of exposure values in WL units. For the important close-in distances in the vicinity of 0.5 mile or less the combined overestimate can easily exceed a factor of 10. Therefore all of the estimates of attributable lung cancer for the "local" (0 to 6 miles), "regional" (6 to 50 miles), and "national" (beyond 50 miles) populations become invalid overestimates.

Those estimates totalled only 2 premature deaths per year from lung cancer attributable to radon released from all the 22 inactive uranium tailings piles without remedial action. This is to be compared with the death rate of 92,000 per year from lung cancer.

2. Radon Flux: Natural and Man-Made.

In round numbers, the average radium concentration of the earth's sufface soils and rocks is about 1 pCi Ra/gram, or 2 Ci of Ra and 6 tons of uranium per square mile to a depth of 1 foot. This radium is a source which supplies atmospheric radon at a rate of about 1 pCi Rn/meter^2 · sec. Good grade uranium tailings piles, if dry and unstabilized, have a nominal flux of about 640 pCi Rn/meter^2 · sec. Therefore a handy rule of thumb is that the annual average radon flux from 1 acre of tailings is equal to that from 1 square mile of ordinary land, prairie, back yard, pasture, or desert.

The radon flux varies with rainfall and soil moisture content, freezing and thawing, fluctuations in barometric pressure and surface wind speed, plowing of fields, growth of crops, and other factors.

The 1966 to 1976 increase in the water level of the Great Salt Lake produced a decrease in radon emission in the Salt Lake City area which was 8 times the radon emission of the Salt Lake City uranium tailings pile. A change of 2% in the area of inland waters in the U. S. changes the national radon emission by an amount exceeding the total radon emission from all inactive uranium tailings piles.

The total radon released from all inactive unstabilized uranium tailings piles is a minute fraction of the variations produced by meteorological conditions and agriculture in the total radon released by natural processes from all land areas. The level of radon-decay-product exposure from unstabilized uranium tailings piles, at distances greater than 1/4 to 1/2 mile, is a minute fraction of the range of fluctuations of the natural background in the area. Under the ALARA principle no substantial action to reduce the exposure is warranted.

3. Lung Cancer Risk Factors.

The DEIS gives 4 different values for the lifetime absolute lung cancer risk factor, ranging from 3.0 to 11.1 per 10,000 person-WLM. These risk factors derive from unpublished data, never given peer review, and relate only to underground uranium miners. For the low-level exposure of the general population, not involved in underground labor, the recently published recommendation by 6 widely recognized senior specialists from 4 countries should be used. This is a lifetime risk with an upper bound of 1 per 10,000 WLM and with a lower bound which may include zero.

Adoption of 1 x 10^{-4} per WLM in place of values between 3.0 and 11.1 x 10^{-4} per WLM will reduce all estimated health effects (2 deaths per year, nationwide) by a factor somewhere between 3 and 10. Standards which were prepared on the older basis of risk can be relaxed to 3 to 10 times the proposals in FR81. This shift is in addition to, and in the same direction as, the corrections discussed earlier for radon-decay-product dispersion patterns.

4. Working Level and Working Level Months per Year.

The WLM unit of exposure is the product of exposure rate expressed as the radioactive concentration WL in the inhaled air, and the duration of the exposure M in units of the nominal 170-hour working month. Neither WL nor M has any dependence on air density or breathing rate. Therefore, for an exposure rate of 1 WL, extending uniformly for an entire year of 8760 hours, the exposure is 1 WL yr = 51.5 WLM. The relationship 1 WL yr = 27 WLM used in the DEIS on ground of differences in breathing rates is inaccurate. Differences in breathing rate is just one of many parameters which enter the estimation of the lung cancer risk factor for the general population from the basic data on uranium miners.

5. Fractional Occupancy Time.

The conversion factor between WL yr and WLM does depend on the duratio of exposure time M measured in units of 170-hours. If the relevant exposure rate is in a workplace then the fractional occupancy factor would be 170/730 = 0.23, and 1 WL yr would equal 0.23 (51 WLM/yr) = 12 WLM.

Lifetime exposure in WLM will depend upon a variety of WL exposure rates experienced for various occupancy times in various work places, residences, shops, out-of-doors, etc. Regulatory guides on permissible WL in occupiable structures should recognize that the lifetime weighted average WL exposure rate is more important than the maximum WL experienced in a particular home or workplace. An average occupancy factor in the vicinity of 0.5 or less would seem reasonable. Then the conversion factor 1 WL yr = 27 WLM could be retained on a basis of fractional occupancy factor.

6. Indoor Radon Decay Product Concentration Standard.

With newer risk factors and cost effectiveness in view, an action level of 0.03 WL or 0.04 WL would involve less risk and much less implementation cost than had been associated with the 0.015 WL proposed in FR81.

7. Radon Flux from Stabilized Tailings Piles.

No radiobiological justification is known for the proposed radon flux limitation of 2 pCi Rn/m^2 · sec. It is unnecessary for "the protection of the public health, safety, and welfare, and the regulation of interstate commerce". Its implementation through massive translocations of earth and/or tailings would be very expensive, would be inflationary to the economy, and would be hazardous to the health of workers and the general public.

The mathematical justifications given in FR81 are distinctly inaccurate and hence the conclusions drawn from them are invalid.

The underlying purposes of PL 95-604 with respect to radon flux suppression would be fulfilled by procedures equivalent to providing a sturdy and durable cover of soil and vegetation adequate to prevent erosion and dispersion of tailings by extremes of weather, including rain, snow, ice, and windstorms, and by including a small buffer zone without habitable buildings in the area under Federal or State custody after completion of the remedial action program.

8. Gamma Radiation from Tailings Piles.

The gamma radiation offers no health hazard. Substantially all of the gamma radiation is self-absorbed within the pile. The external gamma

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radiation originates almost entirely from the outer one foot of tailings. It is easily absorbed by one or two feet of earth cover.

The attenuation of gamma radiation from the pile by overburden does not follow an exponential law, as would be the case for a point source. The concept of half-value-layer is not applicable to extended sources. Instead, the attenuation can be shown to follow a second-degree exponential integral. The actual attenuation by only 0.5 meters (20 inches) of soil is more than 5 times greater than given by the simple exponential transmission formula used in the DEIS. Some numerical examples are included in the detailed commentary. This bit of radiation physics can be corrected easily in any later version of the EIS. The FR81 is not affected.

9. Longevity of Disposal Standards.

The FR81 requests "... comments on whether 1000 years is the best choice". "Disposal" without any form of occasional surveillance is impracticable. "Management", not "disposal", is a more realistic plan.

Brief consideration of the changes which have taken place in recent centuries, from the Norman Conquest, to the fall of the Aztec civilization, and the founding of our Republic, suggest that it is impossible to predict even the state of the healing arts 100 years from now.

With Federal or State custody of the stabilized tailings sites planned under Section 202 of PL 95-604 after remedial action is completed, even 100 to 200 years seems a more than adequate time span.

10. Radium in Soil.

The 5 pCi Ra/g soil standard seems reasonable if it is intended to apply to cover materials near the surface. But the proposed rule needs to be clarified on the depth to which the "below 1 foot" rule applies. If it is any considerable depth then the radon flux at the surface could be 5 pCi Rn/m^2 · sec, another reason for dropping the 2 pCi Rn/m^2 · sec concept.

11. Radium in Drinking Water.

Based on long-term epidemiological studies and on recent ICRP recommendations on annual limits of intake (ALI), raising the EPA drinking water standard for Ra-226 and Ra-228 from 5 pCi/liter to at least 30 pCi/liter can be shown to have a safety factor of at least 3 to 4 orders of magnitude with respect to the international radium MPBB standard of 0.1 μCi Ra. This can be shown without making any assumptions about the shape of the dose vs. response curve.

1. RADON FLUX AND DISPERSION

The estimate that without remedial action the radon from all the 22 inactive uranium tailings piles might cause about 2 premature lung cancer deaths per year in the nation (FR81, page 2558, column 1, and DEIS Tables 4-1 plus 4-6) should be compared with the national lung cancer death rate of 92,000 per year (Am. Cancer Soc. "Cancer Facts and Figures" 1978). As we shall see later the 2 lung cancer deaths per year is a substantial overestimate. But accepting the estimate provisionally for illustrative purposes, a remedial action which reduced the radon flux from a typical tailings pile by say a factor of about 20 would reduce this estimate to 0.1 lung cancer deaths per year (or 1 per 10 years) attributable to treated inactive uranium tailings. This is about one-millionth of the national lung cancer mortality, and even if overestimated is surely below any realistic level of significance.

The estimate of detriment due to radon from a tailings pile depends multiplicatively on three factors: (1) the radon flux from the pile, (2) the lateral dispersion of this radon in the environs, and (3) the lung cancer risk factor per working level month (WLM) for exposed persons.

The radon flux from a typical inactive and unstabilized tailings pile has often been taken as about 640 pCi Rn/m^2 · sec (e.g., J.J. Swift et al. EPA-520/1-76-001, page 12) which will suffice here as a nominal "source term" although many piles have a smaller flux (DEIS, page 3-2).

The radial dispersion of this radon in the environs is treated in DEIS, chapter 4 and especially Table 4-2. This topic seems to me to require complete reconsideration and revision. Although no basis is given in the text, Table 4-2 lists calculated exposure in WL at 8 distances from 0.2 miles to 40 miles from the edge of a tailings pile which releases 10,000 Ci of radon per year (essentially equivalent to the Salt Lake City tailings pile as listed in Table 3-1 of the DEIS). The model used for this calculation can be reconstructed by plotting the tabulated values. These turn out to form a straight line with a slope of -1.7 on log-log paper (except for the point at 2 miles where the tabulated WL should read 0.0003 instead of 0.0004 WL). Therefore the radial dispersion model assumed by the author of this section was simply:

$$WL = 0.001\ D^{-1.7} \qquad (1)$$

where D is the distance in miles. There are several theoretical and experimental reasons for rejecting this model.

The text states that the model assumes a symmetrical wind pattern around the pile, with a constant speed of 6.5 mph. Also that a constant 50% equilibrium between radon and its decay products is assumed in outside air within 25 miles, and 70% equilibrium in outside and inside air at more than 25 miles.

Of course there are no decay products present when the radon emerges from the tailings pile. At a wind speed of 6.5 mph the travel time to a distance of 0.5 mile is 4.6 minutes. The build-up of decay products in young air has been shown to be well approximated by:

$$WL = 0.023\ t^{0.85} \qquad (2)$$

for 100 pCi Rn/liter, and time t from 1 to 40 minutes (Evans, "Engineers' Guide to

the Elementary Behavior of Radon Daughters", Health Physics 17, 229-252 (1969)). Therefore in the 4.6 minute air at a distance of 0.5 mile the WL is less than 9% of equilibrium, rather than the 50% assumed in Table 4-2.

The WL values in Equation (1) are clearly incorrect. Because WL = 0.5 for 100 pCi Rn/liter air was assumed for all distances in Table 4-2, one WL corresponds to 200 pCi Rn/liter and we may rewrite Equation (1) in terms of radon concentration versus distance. Then:

$$Rn(pCi/liter) = 0.2\ D^{-1.7} \qquad (3)$$

This power function relationship is slower than an inverse square diminution of Rn with distance. It bears no resemblance to the exponential Gaussian-type dispersion formulas commonly employed in meteorological atmospheric pathway models (e.g., EPA-520/9-73-003-B, page A-2). No theoretical justification is found in DEIS for this power-function dispersion model.

Recall that there are good experimental values for the annual average Rn concentration as a function of distance from the tailings piles in Salt Lake City, Grand Junction, Monticello, and Durango, by S. D. Shearer Jr. and C. W. Sill between June 1967 and October 1968 (Health Physics 17, 77-88 (1969)), and for the Grand Junction pile between April 1974 and April 1975 by David L. Duncan et al. (EPA publication ORP/LV-77-1). For all sampling stations which were free from the overt local use of tailings, there was no measurable atmospheric radon from tailings at distances of 0.5 mile or more. Shearer and Sill wrote:

> "The tailings at Grand Junction are not affecting the atmospheric radon concentrations beyond a distance of 0.5 mile in the prevailing wind directions. At the other three study locations the effect of tailings is not observed at distances greater than one-quarter to one-half mile."

The measurements in 1974-1975 by Duncan et al. at Grand Junction, after that pile was restructured and stabilized in 1970, were in substantial agreement with the 1967-1968 measurements of Shearer and Sill at all the 12 off-pile sampling stations which were common to the two studies. Duncan et al. were unaware that at least 4 of their sampling stations were heavily contaminated, especially their station No. 10 at 645 E. 4th Ave. This led them to propose, erroneously, that at Grand Junction in the quadrant between 270 degrees (west) and 360 degrees (north) there was a "power curve relation" (meaning a straight line of unstated slope on log-log graph paper) between radon concentration and distance out to 1.5 miles. When the contaminated station No. 10 is excluded from the stations in the 270 to 360 degrees quadrant, their "power curve relation" disappears. Duncan et al. could not find any such relationship in the other 3 quadrants either. The radon concentration at distances of 0.5 mile or more from the center of the Grand Junction pile have the background value of about 0.8 ± 0.2 pCi Rn/liter.

Possibly the use of Equation (1) for the dispersion of radon from a tailings pile arose from this inaccuracy of interpretation in the report of Duncan et al. You will recall that I wrote to you on August 21, 1980 with full details of the effects of the several contaminated sampling stations at Grand Junction, and that you followed this up with a written request of September 24, 1980 to David Duncan requesting a response. However I have received nothing so far from him.

Equation (1), in its Rn concentration form as Equation (3), predicts a concentration of Rn from the Salt Lake City pile of 1.0 pCi Rn/liter at a distance of 0.4 mile, and 0.6 pCi Rn/liter at a distance of 0.5 mile from the pile. However in Salt Lake City the measured Rn concentration at stations 83 and 84, which are about 0.3 and 0.4 miles from the pile, have annual average concentrations of 0.43 and 0.39 pCi Rn/liter. These are not statistically different from the average background of the city which is 0.38 pCi Rn/liter.

It is impossible that the predicted value of an additional 1.0 pCi Rn/liter at 0.4 mile and 0.6 pCi Rn/liter at 0.5 mile from the pile could have escaped detection. The power function model of Equations (1) and (3), and of Table 4-2 is invalidated by the experimental evidence of radon dispersion as measured at 4 different inactive tailings piles. The dispersion model overestimates the radon concentrations. The incorrect assumption of 50% decay product equilibrium further enhances the overestimate of exposure values in WL units. For the important close-in distances in the vicinity of 0.5 mile or less the combined overestimate can easily exceed a factor of 10.

A more sophisticated model for the dispersion of radon from a large tailings pile has been reported elsewhere (F. F. Haywood et al. "Assessment of Radiological Impact of the Inactive Uranium-Mill Tailings Pile at Salt Lake City, Utah", ORNL/TM-5251 (1977)). This model uses the Oak Ridge "Comprehensive Atmospheric Transport and Diffusion Model" of Culkowski and Patterson (ORNL-NSF-EATC-17, 1976). Radon concentrations predicted by this elaborate model are compared with the values measured experimentally by Shearer and Sill for the Salt Lake City pile in Table 14 of the F. F. Haywood et al. document. At every one of the 10 away-from-pile measurement stations, ranging from 0.3 to 2 miles from the Salt Lake City pile, the ORNL model also overestimates the actual observed radon concentration. Again, the discrepancies are particularly large for locations nearest to the edge of the pile.

I was peripherally involved in the 1967 to 1968 radon studies by Shearer and Sill at Grand Junction, Salt Lake City, Durango, and Monticello, and I can personally certify to the accuracy of their sampling procedures and of their radon measurements. Where there is disagreement between a theoretical model and the measured radon concentrations it is the model which is inaccurate.

The conclusion is inescapable that the particular radon dispersion model used, and indeed any known model grossly overestimates the actual radon concentrations attributable to the tailings piles. Therefore, all of the estimates of attributable lung cancer for the "local" (0 to 6 miles), "regional" (6 to 50 miles), and "national" (beyond 50 miles) populations become invalid overestimates.

2. RADON FLUX: NATURAL and MAN-MADE

The average concentration of radium-226, in equilibrium with its parent uranium-238, in surface soils and rocks is in the domain of 1 pCi Ra/g of earth. At this concentration the content per square mile of ordinary land, to a depth of 1 foot, is 2 grams (or 2 Curies) of radium and 6 tons of uranium. A portion of the radon-222 produced by radium in the soil and rocks escapes from the crystal grains and diffuses slowly throughout the interstitial voids. Some of this diffusing radon, mostly from within less than 2 meters from the surface, reaches the earth-air interface and escapes into the atmosphere. The flux of radon which diffuses through the earth-air interface depends on several characteristics of the soil or rock, including porosity, moisture content, grass or other cover crops, freezing and thawing, and also on fluctuations in barometric pressure and surface wind speed. A reasonable annual average value is 1 pCi Rn/m^2 · sec, with variations expected mostly in the domain of 0.5 to 5 pCi Rn/m^2 · sec. Rundo et al. measured a flux of 7 pCi Rn/m^2 · sec from soil containing about 1 pCi Ra/g in the unpaved crawl space under an Illinois home (Health Phys. 36, 729-730 (1979)).

If the average inactive unstabilized uranium tailings pile releases a radon flux of 640 pCi Rn/m^2 · sec (J. J. Swift et al. EPA-520/1-76-001, page 12), then each square meter of tailings would have the same radon release as 640 square meters of ordinary land. In the same ratio, each acre of inactive tailings would have the same radon release as 640 acres of land. But 640 acres is one square mile. Thus we have the handy-dandy rule of thumb that on the average each acre of inactive tailings releases to the atmosphere the same quantity of radon as one square mile of land, prairie, back yard, pasture, or desert. In brief, for radon release:

$$1 \text{ acre of unstabilized inactive tailings} \cong 1 \text{ square mile of ordinary land} \qquad (4)$$

The Salt Lake City uranium tailings pile is one of the largest which is near a well-populated region in the U. S. Its area is given as 100 acres (DEIS, page 3-3). The radon released from the inactive uranium pile at Salt Lake City is therefore equivalent to that from about 100 square miles of natural land, or a circle 5.6 miles in radius.

The Great Salt Lake lies in Salt Lake City's front yard to the northwest. In 1976 the water level in the Great Salt Lake had risen about 11 feet above its level a decade earlier. The lake had spread "over 1,700 square miles - nearly twice the surface of a decade ago." (Utah's Great Salt Lake Advisory Board: United Press International, Oct. 24, 1976). Thus some 800 square miles of land became covered by water, and had its radon flux cut off. This natural process therefore reduced the annual radon released into the Salt Lake City regional air by 8 times as much as the annual release from the tailings pile. On a regional basis, even this great tailings pile near a heavily populated area has an atmospheric radon influence which is not only overwhelmed by the natural radon flux of the area but is much smaller than the fluctuations in the regional radon flux which are caused by variations in the water level in the Great Salt Lake. If the radon emission from the lake shore is not worth controlling, what magnitude of resources should be expended to minimize the much smaller radon emission from the tailings pile?

Moving along to the national scene, the total area of all the 23 inactive uranium tailings piles, as listed on pages 3-2 and 3-3 of the DEIS, is 1021 acres. Most of these have tabulated radon flux rates which are substantially smaller than the nominal 640 pCi Rn/m^2 · sec. But for ease of visualization, we may consider 1000 acres of inactive tailings with nominal radon flux. Then all the inactive tailings, if unstabilized, have a total radon emission equivalent to not more than 1000 square miles of land area. How shall we visualize 1000 square miles? It is smaller than the area of a square 32 miles on a side, or of a circle with a radius of 18 miles. One thousand square miles is less than 1% of the area of Colorado, or of Nevada. It is less than 1/3000th (1/30th %) of the area of the 48 continental United States. Moreover, these states contain over 55,000 square miles of inland water, hence every 2% change in the area of inland waters changes the national radon emission by an amount exceeding the total radon emission from all inactive uranium tailings piles. The Great Lakes have an area of some 95,000 square miles, hence every 1% change in their shoreline area changes the radon emission by as much as all the unstabilized inactive tailings piles.

The Netherlands have been gradually diking portions of the Zuyder Zee and have created a total of 3,000 square miles of new land for agricultural and other uses (Encycl. Brit. Macropedia, 12, p. 1058 (1974)). Thus the radon emission from the new land area created in The Netherlands exceeds by a factor of 3 the radon emission from all U. S. inactive uranium tailings piles. Would the Dutch, or any of their neighboring nations, initiate remedial action to suppress this man-made radon release? Would anyone contend that 3000 square miles of new land is an environmental hazard or that it introduced a risk of premature or excess deaths from lung cancer?

The radon flux from farm land is influenced by many factors. Plowing exposes new surfaces and radon-rich interstitial voids from beneath the surface. There is surely a net surge of radon release during and for some time after plowing. Crops and other plants and trees, whose roots are in the subsurface interstitial spaces, where the concentration of diffusing radon is high, bring radon through their own pores and can increase the overall radon emission per unit area of soil by as much as a factor of 2 or 3 for some broad-leaf crops (J. E. Pearson and G. E. Jones, Tellus 18, 655-662 (1966)). Large changes in radon flux are also produced by flooding or drought and by freezing or thawing.

Significant increases in the radium-226 content, and hence in the radon flux from agricultural lands in Illinois and other midwest areas, have been produced by the use of some phosphate fertilizers and ground waters with elevated radium content, as Norman Frigerio pointed out several years ago.

In summary, the total radon released from all inactive unstabilized uranium tailings piles is a minute fraction of the variations produced by meteorological conditions and agriculture in the total radon released by natural processes from all land areas. The level of radon-decay-product exposure at distances greater than 1/4 to 1/2 mile, is a minute fraction of the range of fluctuation of the natural background in the area. Under the ALARA principle no substantial action to reduce the exposure is warranted.

Addition of the radon flux from the tailings of active uranium mills does not change any of these generalizations. An earlier EPA statement of the total area of tailings piles in 1970 (presumably in the U.S.A.) was 2100 acres (EPA-520/9-73-003-B, (1973), page 51). If this estimate was accurate it would imply that the active tailings piles were substantially equal in area to the inactive piles. This would not double the total radon released because many of the active piles have a high moisture content. ORNL concluded that "moist tailings" emit only 50% as much radon as "dry tailings", while "wet tailings" emit only 20% as much radon as dry tailings (ORNL/TM-5251, page 18). Submerged tailings can release substantially no radon to the atmosphere. In view of Shearer and Sill's observation that the inactive piles at Salt Lake City, Grand Junction, Durango, and Monticello produce no measurable increase in the atmospheric radon concentration at distances greater than 1/4 to 1/2 mile, it is comforting, but not surprising, that Professor Marvin Wilkening could detect no radon from all the tailings piles plus mine ventilation exhausts from Ambrosia Lake at his laboratory in Socorro, NM, a downwind distance of nearly 100 miles (Personal communication, May 18,1981).

3. LUNG CANCER RISK FACTORS

Estimates of the health effects due to radon emission from inactive uranium tailings piles depend multiplicatively on three factors: radon flux, radon dispersion in the environment and the growth of radon decay products with elapsed time, and the lifetime lung cancer risk factor per working-level-month (WLM) of inhaled radon decay products. We have seen that the measured values of radon concentrations are very much smaller than the values derived from theoretical models. Therefore the health effects were overestimated.

In the following discussion we will see that the lifetime risk factors per WLM were also overestimated. These risk factors also contribute to the proposed overrestrictive standards for radon flux after stabilization and for working level (WL) values in occupiable buildings.

Health Effects Estimates in FR81.

Quantitative estimates of health effects are treated in paragraphs numbered 2 and 4 in column 1 on page 2558 of FR81. In paragraph 2 we read:

> "For example, we estimate that individuals living continuously one mile from a large pile would have about 200 times as great a chance of a fatal lung cancer caused by radon decay products as persons living 20 miles away (7 in 10,000 versus 3 in 1,000,000)."

This unfortunate sentence is obviously a misstatement. We recall that there is no measurable difference in the ambient atmospheric concentration of radon at distances greater than 1/4 to 1/2 mile from large unstabilized inactive piles. Any contribution from the pile is a small fraction of the normal fluctuations in the annual average background due to meteorological and horticultural variables. The author of the quoted sentence may have had in mind only pile-produced radon. But that is is not what the prose says. A lay reader, a legislator, or a state or county officer could be totally misled concerning the effective radius of pile-produced radon.

The truth is there is no significant difference between 1 and 20 miles, not a factor of 200.

The estimates in paragraph 4 concerning national effects on persons living more than 50 miles away from a pile, "40 to 90 deaths from lung cancer per century", (or 0.4 to 0.9 per year, out of an unstated national total of 92,000 per year) is also both misleading and invalid.

Even though the possible detriment or harm from pile-produced radon is much smaller than estimated in FR81 and the DEIS, I agree that the detriment from other airborne radionuclides (U, Ra, Po, etc.), or from gamma radiation are "far less significant" (FR81, p. 2558, line 3), indeed they are negligible. A year-long survey in 1974 at a station on the Salt Lake City pile showed that none of 26 separate samples of airborne dust had activities greater than the MPC$_a$ for Ra-226, Pb-210, Po-210, Th-230, U-234, U-235, or U-238 (F. F. Haywood, et al. ORNL/TM-5251, page 21). Also the gamma radiation from this large unstabilized pile is small, decreases rapidly with distance from the pile (Haywood, loc. cit., page 61), and would be reduced everywhere to normal background levels by a covering of less than two feet of earth (DEIS, page 5-8).

Health Effect Estimates in the DEIS.

With respect to radon decay product risk factors FR81 properly states that (page 2558):

> "Additional uncertainty comes from our incomplete knowledge of the effects on people of these generally low exposures"

The DEIS estimates of lung cancer risk (pages 4-6 to 4-11) per WLM involve both relative risk and absolute risk. My preference is for absolute risk, which coincides with yours, with that of Jacobi, Stewart, McLean, and Harley, and with ICRP and NCRP. For absolute lifetime risk the DEIS appears to have as many as 4 different values in a span of 4 pages of text. These warrant discussion and comment, for resolution in future publications.

On DEIS page 4-8, we read:

> "For absolute risk, we use the estimate of 10 lung cancer deaths per WLM for one million person-years at risk reported by the National Academy of Sciences (NA76)."

The bibliographic reference (NA76) is not found in the list of References. From a similar statement credited to "Na76" in EPA 520/4-78-013 (1979) on Florida Phosphate Lands the reference must be a National Research Council report supported by the EPA Office of Radiation Programs on "Health Effects of Alpha-Emitting Particles in the Respiratory Tract", issued in October 1976 as EPA 520/4-76-013.

That entire document actually relates to the plutonium "hot particle" flap generated by a Cochran and Tamplin hypothesis which fueled the National Resources Defense Council petition to the EPA that the plutonium-in-lung standard be reduced by a factor of 115,000. The major issues relate to the relative insensitivity to radiation displayed by the alveolar region of the animal and human lung, as compared with the hilar region. The conclusion was that for inhaled insoluble plutonium aerosols "the carcinogenic response is more a function of the amount of radio-

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activity in the lung than its distribution". Thus "hot particles" of plutonium were judged to be no more hazardous than a uniform distribution.

The 18-page report has a 77-page appendix comprising comments on usually relevant topics by the committee members. One of the 10 members of this ad hoc committee on hot particles was Professor Edward Radford. Ted Radford's 3-page contribution to the appendix deals mainly with the location (alveolar vs. hilar) of lung tumors associated with various agents including cigarette smoke, asbestos, compounds of arsenic, nickel, and chromium, various organic chemicals, and alpha radiation. He commented on the 1972 BEIR report estimate of 0.63 cases per 10^6 person-rem-year for the radon decay product risk factor for underground uranium miners (not for members of the general population), then stated"

> "Finally, it has been possible to update the U. S. uranium miners study group to 1972 (88). ... modifying the definition of period of risk ... to 10 years after beginning of mining ... results in a revised absolute risk of about 2 cases/rem/10^6 person-years."

Radford's bibliographic reference (88) to support this conclusion is:

88. V. E. Archer and E. P. Radford, unpublished data, 1975.

Thus no supporting data have been supplied, and Radford's recommendation in 1976 has never had peer review. Radford did not express his risk factor in units of WLM. The dosimetric conversion used in the 1972 BEIR report was 5 rem = 1 WLM. Applying this to Radford's statement would make his risk factor for uranium miners 10 cases per WLM for 10^6 person-years as used for the general public in EPA 520/4-78-013 on Florida Phosphate Lands and in the DEIS. This 10^{-5} per WLM · yr is derived from a proposal of Radford's, rather than being the concensus of any committee of the National Academy of Sciences.

When this per-year risk estimate is integrated over a 70-year average lifespan, assuming that the per-year risk factor is independent of age and does not diminish with time after exposure, that the rate of exposure in WLM/year is constant, that competing causes of death do not shorten the average lifespan, that a 10-year minimum latency is associated with each element of acquired risk, and that therefore the accumulation of risk and associated "wasted" WLM terminates 10 yrs before the end of the 70-year lifespan, then the 10^{-5} risk factor per year and per accumulated WLM integrates to an equivalent lifetime risk of 3.0×10^{-4} per accumulated WLM.

This numerical correspondence between the risk per year and the lifetime risk is in agreement with a relationship which can be derived from an example of lifetime risk given in Table 10 of the Florida Phosphate Lands document EPA 520/4-78-013. Hence we appear to be in agreement that under the assumptions listed above, the integrated relationship is:

$$\left(\begin{matrix}\text{lifetime}\\ \text{risk}\end{matrix}\right) = \frac{1}{2}\left(\begin{matrix}\text{risk per}\\ \text{yr} \cdot \text{WLM}\end{matrix}\right)\left(\begin{matrix}\text{life-long exposure}\\ \text{rate in WLM/yr}\end{matrix}\right)\left(\begin{matrix}\text{lifetime minus}\\ \text{latency, in years}\end{matrix}\right)^2 \qquad (5)$$

A second estimate of the lifetime absolute risk factor can be deduced from the statement (page 4-9 of DEIS) that a life table analysis yields a 0.6% lifetime risk for continuous exposure to 0.01 WL. Assuming that the 10-year latency concept has been retained in this life-table analysis, the relevant lifetime exposure, using the 27 WLM/WL yr conversion factor from page 4-6, is

(0.01 WL)(60 yr)(27 WLM/WL yr) = 16.2 WLM,

and the lifetime risk factor would be 0.006/16.2 = 3.7 x 10^{-4} per WLM. It is interesting that the shortening of some lives by intercurrent disease or trauma, which occurs through the use of a life-table analysis, results in a higher lifetime risk factor rather than a lower one. Incidentally, the lifetime risk of lung cancer in the general U.S.A. population is said to be closer to 4% than to the 2.9% stated, on page 4-9, to have resulted from the Cook et al. computer program and life-table analysis. The discrepancies may be related.

A third estimate of lifetime risk is implicit in the statement at the bottom of page 4-9 of DEIS, which reads:

> "A person's average annual risk from a lifetime of exposure may be obtained by dividing the lifetime risk estimates given above by an average lifespan of 71 years."

This would mean that the lifetime risk is the annual risk multiplied by 71 years, or (10^{-5}/WLM · yr)(71 yr) = 7.1 x 10^{-4} per WLM. The integrations which lead to Equation (5) may have been overlooked when this simple relationship was stated.

A fourth estimate of absolute lifetime risk is the statement on page 4-10 of DEIS:

> "... our firmest estimate is that increased levels of radon will produce an additional 1 to 3 lung cancer deaths per year of exposure for each 100 person-working-levels of lifetime exposure".

For 100 persons at one WL, and the conversion factors and latency already discussed, this is a lifetime exposure of (1 WL)(27 WLM/WL yr)(70 - 10 yr) = 1620 WLM. Then the lifetime risk factor per person would be (1 to 3 deaths/yr)(60 yr)/(100 persons)(1620 WLM) = 3.7 to 11.1 x 10^{-4} per WLM .

Thus the 4 pages of the DEIS which deal with the lung cancer risk factor seem to contain 4 different values for the lifetime absolute risk factor in units of 10^{-4} per WLM, namely 3.0, 3.7, 7.1, and 3.7 to 11.1. The range is nearly a factor of 4.

Update of Lifetime Risk Factor.

Fortunately this uncertainty can be resolved easily in a later version of the EIS. As you know, there has just become available the "international concensus" risk-factor which resulted from a week-long workshop of invited international specialists invited by the Nuclear Energy Agency of the Organisation for Economic Cooperation and Development in Paris to convene at the EPA offices in Arlington in 1978. As you know from your participation, the task group on radon included the leading experts at the extremes of modeling (W. Jacobi) and of epidemiology (C. G. Stewart) and all views in between. The manuscript recommendations of Archer, Radford, Axelson, et al. were in hand. These were rejected, as was their paper when later independently refereed and rejected by the editor of Radiation Research.

The radon task group easily reached unanimous agreement that the upper limit of lifetime absolute risk is 1 x 10^{-4} per WLM for members of the general population. The radon task group's findings were accepted by the international workshop membership as a whole, which included strong representation of the ICRP (D. Beninson B. Lindell, and others) and representatives of other nations besides the 4 nations represented in the radon task group. The text of the radon task group's recommendations apparently got lost somewhere in the communication chain between the OECD, IAEA, and ICRP, and did not appear anywhere in print. Following nearly 2 years of subsequent correspondence, and a long series of drafts which resulted in unanimous agreement on all final details of wording, the conclusions have at last been published in the open literature. The reference is of course, R. D. Evans, J. H. Harley, W. Jacobi, A. S. McLean, W. A. Mills and C. G. Stewart, "Estimate of Risk from Environmental Exposure to Radon-222 and Its Decay Products", Nature 290, 98-100 (March 12, 1981). The authors noted that 10^{-4} per WLM was to be taken as the upper bound, and that "the estimate of risk for low-level exposure may even include zero as a lower bound."

I, for one, feel that the EPA now has a clear scientifically-based mandate to adopt 1 x 10^{-4} per WLM as its upper limit for the lifetime absolute risk factor in all future considerations of possible radon decay product health effects.

Influence of Risk Factor on Proposed Standards.

Adoption of 1 x 10^{-4} per WLM in place of values between 3.0 and 11.1 x 10^{-4} per WLM will reduce all estimated health effects by a factor somewhere between 3 and 10. Standards which were proposed on the older basis of risk can be relaxed to 3 to 10 times the proposals in FR81. This shift is in addition to, and in the same direction as, the corrections discussed earlier for radon-decay-product dispersion patterns.

Updating the DEIS Text.

Incidentally, in a rewrite of the DEIS section 4.3 on lung cancer risks, it would be appropriate to replace the references EP78 and AR79 in the opening paragraph by a more representative selection of recent reports. Archer's AR79 is an almost inaccessible paper at a symposium, and had no peer review. His most recent full compilation and tabulation of the USPHS study cases, in a refereed journal, is, I believe, V. E. Archer, J. K. Wagoner, and F. E. Lundin, Health Phys. 25, 351-371 (1973), and this would be a good basic reference. (These are most probably the data with which Ted Radford made his recalculation of per-year risk in 1976). Figure 4-2 on page 4-7, from Archer 79, is related to the rejected Archer-Radford-Axelson manuscript and should be deleted because it is so misleading. The Czech, Canadian, and Swedish data involve confounding variables and should not be plotted with U.S. data. Two references which would enhance the bibliography in the opening paragraph are, of course, D. K. Myers and C. G. Stewart, "Some Health Aspects of Canadian Uranium Mining', AECL-5970, Chalk River Nuclear Laboratories (1979), and W. Jacobi and K. Eisfeld, "Dose to Tissues and Effective Dose Equivalent by Inhalation of Radon-222, Radon-220 and Their Short-Lived Daughters", GSF-Report S-626, Institut fur Strahlenschutz, Munich (1980).

In Summary.

The DEIS gives 4 different values for the lifetime absolute lung cancer risk factor, ranging from 3.0 to 11.1 in units of 10^{-4} per WLM, i.e., per 10,000 person-WLM. These risk factors derive from unpublished data, never given peer review, and relate only to underground uranium miners. For the low-level exposure of the general population, not involved in underground labor, the recently published recommendation by six widely recognized senior specialists from four countries should be used. This is a lifetime risk with an upper bound or maximum value of 1×10^{-4} per WLM, and with a lower bound which may include zero.

4. WORKING LEVEL AND WORKING LEVEL MONTHS PER YEAR

The DEIS uses 27 WLM for the full time continuous exposure of members of the general population to one WL for a year, that is 1 WL yr = 27 WLM. The month (M) in WLM is defined correctly as 170 hours on page 4-6 of the DEIS. The correct relationship for full time 100% occupancy is:

$$1 \text{ WL yr} = 1 \text{ WL yr}(8760 \text{ hr/yr})/(170 \text{ hr/M}) = 51.5 \text{ WLM} \qquad (6)$$

The 27 WLM conversion factor was based on the fact that members of the general population breathe fewer liters of air per month than do underground uranium miners (DEIS, page 4-6, and page 48 of the Florida Phosphate Lands EPA 520/4-78-013).

But under the universally accepted definitions of WL (1.3×10^5 MeV of short-lived potential alpha energy per liter of air) and of the working month, M, (170 hours, rounded from 173), the WLM unit is totally independent of breathing rate. For example, members of the general public or miners working at an altitude of 6000 to 7000 feet will have a breathing rate about 20% greater than persons in similar activities near sea level because of the lower density and hence lower oxygen content per liter of air, at higher altitudes. Breathing rate is in no way involved in WLM determinations, which are based only on the radioactivity content per liter of air multiplied by duration of exposure.

The significant difference in breathing rate between uranium miners and members of the general public at the same altitude is only one of many parameters which require two lung cancer risk factors, - one for uranium miners and a smaller one for members of the general public, as discussed earlier. Breathing rate is already accounted for in the maximum lifetime risk factor of 10^{-4} per WLM.

5. FRACTIONAL OCCUPANCY TIME

The conversion factor 1 WL yr = 27 WLM can be salvaged and justified on a basis of fractional occupancy time. What you would need would be an average occupancy factor of 27/51 = 0.53. If a work place is being considered, then the occupancy factor would be about (170 working hours per month)/(730 clock hours per month) = 0.23. Only part of the remaining fraction 0.77 of the time is spent in

the place of residence. (The 0.75 occupancy factor for a residence as adopted in the Florida Phosphate document, page 48, seems too high in spite of its distinguished parentage).

With respect to residences, most people do not spend a 70-year lifetime in one residence, but rather in perhaps 5 to 10 houses. If one or two of these houses had a substantially elevated radon decay product level, an individual's lifetime average exposure could still be in a comfortable range. With this factor in mind, regulatory guides on permissible WL levels in homes or work places should recognize that the lifetime average WL exposure rate is more important than the maximum WL experienced in a particular home or work place.

Probably an average occupancy factor in the vicinity of 0.5 or less would be easy for you to justify, and hence to retain the 1 WL yr = 27 WLM, or even to adopt some smaller value.

6. INDOOR RADON DECAY PRODUCT CONCENTRATION STANDARD

Remedial actions at sites designated under PL 95-604 are "... clearly directed at potential health problems due to tailings ..."(DEIS, page 8-28). Also "... the proposed remedial action level of 0.015 WL (including background) for occupied or occupiable buildings is the most protective level that can be justified for the PL 95-604 remedial action program" (DEIS, page 8-27).

The justification seems to be based on the engineering practicability of achieving levels as low as 0.015 WL, rather than on estimation of the health risk in comparison with other risks regularly accepted in everyday life. It is also quite properly noted that surveys of normal houses with basements in New York, New Jersey, and Grand Junction, without tailings, indicate that (DEIS, page 8-27):

> "... about 10% or more are above 0.015 WL. We have concluded that efforts to reduce levels significantly below 0.015 WL by removing tailings would often be unfruitful, and the funds expended wasted."

If an action level as low as 0.015 WL for tailings remedial action were to be extrapolated by some agency at a later time to normal homes without tailings then several million existing normal homes in the U. S. ("about 10% or more") would become subject to remedial action, recognizing that natural radon from the soil is radiobiologically the same as radon from uranium tailings or from phosphate lands.

An action level as low as 0.015 WL has an extremely high ratio of cost to benefit. This is being demonstrated in Grand Junction where already some $11,000,000 of federal and state tax money has been spent on tailings removal, and an equal additional amount is projected.

Recall that even the long-term widespread dispersion of uranium tailings in Grand Junction is not associated with any measurable excess in lung cancer, in leukemia, or in all cancers (T. J. Mason, et al., "Uranium Mill Tailings and Cancer Mortality in Colorado", J. Nat. Cancer Inst. 49, 661-664 (1972); M. Cunningham, Colorado Disease Bulletin, 6, No. 31 (1978); and NUREG-0706, Vol. II, p. A-34).

Remedial action is taken in Grand Junction for schools and homes at 0.01 WL above background, hence at something approximating 0.017 WL including background (if anybody could make measurements with such accuracy). Recalling 0.03 WL above background as the midpoint of the Grand Junction 0.01 to 0.05 WL gray area in which "remedial action may be suggested", it is interesting to note that the EPA categories of WL as tabulated for 133 measured structures in Polk County, Florida, has its most significant WL-category boundary at 0.03 WL including background, that is a category from 0.01 to 0.03 WL and another at 0.03 to 0.05 WL. No break point at 0.02 WL is discussed (Florida Phosphate Lands, page 23-25). However in the related subsequent publication in FR 44, 38664-38670, July 2, 1979, the recommended remedial action level for residences is an annual average of 0.02 WL, rather than 0.03 WL.

My letter to you dated October 16, 1979 discussed the problems of measurement and enforcement at the suggested 0.02 WL, and recommended that some higher value be chosen because, among other things, the lung cancer risk factor had been overestimated. Now the DEIS document and FR81 have suggested a still lower action level, 0.015 WL. Thus over a span of about 3 years the EPA's suggested action level appears to have been sequentially tightened from 0.03,to 0.02, to 0.015 WL, whereas in the meantime the newer scientific evidence has indicated considerably less risk per WLM than previously assumed.

From the standpoint of the accuracy of environmental measurements or knowledge of radiobiological effects, a standard expressed to 2 significant digits, such as 0.015 WL is unrealistic. Even a single significant digit, such as 0.02, 0.03, or 0.04 WL may imply unwarranted accuracy.

The lung cancer lifetime risk factor of 1×10^{-4} per WLM, as an upper bound, implies that an exposure rate of 1 WLM per year carries less risk of all cancers than does the whole body exposure to 0.5 rem per year, which is the NCRP, ICRP, and 10CFR20 permissible level for members of the general public. Using your 1 WL yr = 27 WLM conversion, 0.04 WL corresponds to 1.1 WLM per year, and 0.03 WL corresponds to 0.8 WLM per year. I therefore recommend either 0.03 WL or 0.04 WL, in place of 0.015 WL, as the minimum annual average for indoor air which requires remedial action if it is caused by "residual radioactive materials from any designated processing site".

With the lifetime risk factor of 1×10^{-4} per WLM in view, as compared with 3 to 11×10^{-4} per WLM used in the DEIS, the lifetime risk of 0.04 WL is less than the lifetime risk which had been associated with the proposed 0.015 WL.

It should be noted that it would be incorrect to use 1/10th of the occupational level of 4 WLM/yr, that is 0.4 WLM/yr for the general population. This is because of differences in breathing rate, environmental factors, age and sex distributions, etc., which led to the designation of 1×10^{-4} per WLM as the upper bound of lifetime risk for the general population.

In summary, with newer risk factors and cost effectiveness in view, an action level of 0.03 WL or 0.04 WL would involve less risk and much less implementation cost than had been associated with the 0.015 WL proposed in FR81, 40CFR paragraph 192.12(b) and Table B.

7. RADON FLUX FROM STABILIZED TAILINGS PILES

The total radon released from all inactive uranium tailings piles is a minute fraction of the variations in the total radon released from ordinary soil, rock, desert, and prairie, as discussed earlier. The level of radon-decay-product exposure from unstabilized uranium tailings piles at distances greater than 1/4 to 1/2 mile is a minute fraction of the range of fluctuation of the natural background in the area.

Only long-term exposures very near to the pile, or directly on the pile, actually have any possible interest as potential health hazards. Quantitatively the DEIS estimate for the local (0 to 6 miles) population near the piles at Salt Lake City, Grand Junction, and 4 other southwestern piles is less than 1 lung cancer per year (DEIS, pp. 4-14 to 4-16). This is an overestimate, by more than a factor of 3, because of the dispersion model and risk factors used. Even so, it is insignificant compared with the unrelated expectation of about 100 lung cancer deaths per year among the 416,000 persons living within 6 miles of these 6 inactive tailings piles.

Thus there really is no significant health problem due to radon flux from the unstabilized tailings piles. The piles could be stabilized and provided with a physically sturdy and durable cover of soil and vegetation. The cover should be designed to prevent erosion and dispersion of tailings by weather (rain, snow, ice, and wind). A weather-resistant cover would be sufficiently thick to reduce the radon flux by probably a factor of at least 10, that is from a nominal 640 pCi $Rn/m^2 \cdot sec$ to the domain of 60 pCi $Rn/m^2 \cdot sec$. I know of no radiobiological reason for any further reduction, provided that habitable structures are excluded from the immediate area of the pile.

I know of no scientific basis for the proposed 2 pCi $Rn/m^2 \cdot sec$. Such a standard would involve substantially more expense and more possibility of serious harm to workers and the general public due to the hazards of moving large amounts of earth. With the provisions in PL 95-604 for Federal custody of disposal sites after completion of the remedial action program, it would seem that a small buffer zone, landscaped but without houses, around a stabilized pile would more than suffice for radiological safety. Thus the purposes of PL 95-604 as stated in Section 2(a) would be fulfilled. Far from being an eyesore, a properly stabilized and landscaped pile could be an attractive public park. Whatever radon flux exists on the stabilized pile has zero WL of decay products initially, and decay products are likely to become measurable only off the pile several minutes downwind.

The problem of estimating the attenuation of radon flux from tailings material by layers of overlying semiporous materials has been the subject of many mathematical studies. Extrapolating from the pathfinding work of Kraner, Schroeder, and Evans at M.I.T. in the early 1960's I believe that many of the recent mathematical models and computer printouts are inaccurate. You will recall my concern that much of the material in the NRC's April 1979 Draft Generic Environmental Impact Statement on Uranium Milling, NUREG-0511, was dubious. In particular, the mathematical formulation for multilayered systems involving widely different diffusion coefficients and porosities, as given in Appenx P of NUREG-0511, seemed impossible to accept. That simple exponential formulation however seems to have been adopted in the DEIS in Chapter 4 and Appendix B. A very much fancier theory appeared in the revision of Appendix P found in the Final GEIS on Uranium Milling, NUREG-0706, dated September 1980.

However I can at this time give full support to the situation in which the tailings material and the cover material have the same diffusion coefficient and porosity. Then all formulations agree that the radon flux due to the pile will be attenuated with exponential dependence on the thickness of the overburden. This special situation allows the concept of half-value-layer (HVL) to be used, so that for thickness t of overburden the transmitted flux is proportional to exp(-0.693t/HVL) as is implicit in the table and graph on pages 5-4 and 5-5 of the DEIS.

The much more complicated dependence when several layers of dissimilar overburden are used may eventually be clarified by full scale experiments which are in a very early stage at the inactive Phillips and United Nuclear pile at Ambrosia Lake.

The text of FR81 is flawed with respect to the proposed radon emission standard of 2 pCi Rn/m^2 · sec. We note that all the backup material in the GEIS operates on a pure single exponential model, exp(-0.693t/HVL). The HVL is taken as a characteristic of the particular overburden material.

Then see FR81, page 2559, column 2,

> "Several analyses[6] of controlling radon emission by covering piles with soil suggest that the required covering thickness rises sharply[7] near an emission rate of about 1 pCi/m^2 · sec."

This statement is as obscure and meaningless as saying that for an isolated radioactive source with an initial activity of say 600 mCi the time one has to wait for the activity to decrease rises sharply near an activity of about 1 mCi.

The footnote "7" is even more confusing. It reads:

> "Reducing the emission rate from 10 to 9 pCi/m^2 · sec (a 10% reduction) requires about 1 cm of added soil: the same size reduction from 2 to 1 pCi/m^2 · sec (50%) takes about 50 cm of added soil."

The author of these selections seems to be unclear on the behavior of exponential systems as compared with linear systems. In this case, if a 50% reduction takes 50 cm of added soil, then the half-value-layer (HVL) is 50 cm. The addition or subtraction of 50 cm of soil will always change the transmitted flux by exactly a factor of 2. This is simply because exp(-0.693t/50) = 1/2 when t = 50. But for a reduction from 10 to 9 pCi/m^2 · sec, we have 9/10 = exp(-0.693t/50), from which it follows that t = 7.6 cm (not "about 1 cm") for any 10% reduction in flux. The numerical illustration in footnote 7 is not a misprint, it is simply wrong.

Still in column 2, of page 2559, of FR81, we read:

> "Higher control levels, say 10 - 40 pCi/m^2 · sec appear unjustified because emission rates of that size can be lowered to 2 pCi/m^2 · sec for about 10% additional cost."

This seems to be another example of some writer's difficulty with exponential functions and multiplicative relationships. To reduce from even a large initial flux of say 600 pCi/m^2 · sec to 40, is a reduction factor of 600/40 = 15. This requires (ln 15)/0.693 = 3.91 half-value-layers. To drop from 40 to 2 pCi/m^2 · sec is a reduction factor of 40/2 = 20. This requires (ln 20)/0.693 = 4.32 additional half-value-layers. Far from requiring "about 10% additional cost", going from 40 to 2 pCi/m^2 · sec requires 4.32/3.91 = 1.10 or 110% more material than was required to go from 600 to 40 pCi/m^2 · sec. These relationships would be true for any covering material, as long as the exponential decrement is valid.

The entire section in FR81 on Proposed Radon Emission Standards is thus flawed by errors in mathematics and hence in reasoning.

I am not particularly troubled by these marked uncertainties and inaccuracies concerning radon flux reduction by overburden, because we have seen that the reasons advanced for proposing a 2 pCi Rn/m^2 · sec guideline are invalid. It is not needed radiobiologically, and it would be very expensive, cost ineffective and inflationary to spend tens of millions of dollars reducing the flux toward such unnecessarily low levels.

In summary, no radiobiological justification is known for the proposed radon flux limitation of 2 pCi Rn/m^2 · sec. It is unnecessary for the "protection of the public health, safety, and welfare, and the regulation of interstate commerce." Its implementation through massive translocations of earth and/or tailings would be very expensive, would be inflationary to the economy, and would be hazardous to the health of workers and the general public. The mathematical justifications given in FR81 are distinctly inaccurate and hence the conclusions drawn from them are invalid. The underlying purposes of PL 95-604 with respect to radon flux suppression would be fulfilled by procedures equivalent to providing a sturdy and durable cover of soil and vegetation adequate to prevent erosion and dispersion of tailings by extremes of weather, such as rain, snow, ice and wind, and by including a small buffer zone without habitable buildings in the area under Federal or State custody after completion of the remedial action program.

8. GAMMA RADIATION FROM TAILINGS PILES

It is true that the gamma radiation from a uranium tailings pile is small and only offers a minute health hazard compared with the already very small health aspects of radon and its decay products. This is because the mean-free-path for the gamma rays of the radium series is only about 10 cm, or 4 inches, of tailings or dirt. Substantially all of the gamma radiation is self-absorbed within the pile. The external gamma radiation originates almost entirely from the outer one foot of tailings.

The attenuation of tailings gamma radiation by soil overburden is not given correctly by Figure 5-2, on page 5-8 of the DEIS. You would want to correct this in any later version of the EIS.

Figure 5-2 is simply a graph of an exponential attenuation, exp(-0.693 y/0.1), where y is the thickness of overburden in meters. However, pure exponential attenuation of gamma rays occurs only for a collimated beam or a point source.

In the case of an extended source, such as a flat surface on a tailings pile, much of the radiation emerging through any square centimeter of surface will have had a diagonal path within the extended source, and will therefore have suffered more attenuation than radiation emitted perpendicular to the surface. When the appropriate mathematics is carried out (see R. D. Evans and R. W. Raitt, Phys. Rev. 48, 171-176 (1935)) the attenuation of the gamma radiation from a uniform semi-infinite source by an overburden of thickness y and linear attenuation coefficient μ is given by the integral

$$E_2(\mu y) = \int_1^\infty e^{-\mu y z} z^{-2}\, dz \qquad (7)$$

This cannot be integrated in closed form but must be tabulated. Originally called the Gold integral (E. Gold, Proc. Roy. Soc. Lon. A82, 43 (1909)), $E_2(\mu y)$ is now known as one of a family of "exponential integrals". These are involved in the shielding of nuclear reactors. Convenient tables will be found in H.Etherington, "Nuclear Engineering Handbook", McGraw-Hill (1958), page 1-122.

The concept of half-value-layers does not apply to extended sources. The consequences are significant. For example the ratio of extended source attenuation, $E_2(\mu y)$, to point source attenuation, exp(-μy) for several values of μy is:

μy	0.693	1	2	4	6
$E_2(\mu y)/\exp(-\mu y)$	0.48	0.40	0.28	0.17	0.13

Thus Figure 5-2 of the DEIS underestimates the attenuation at 0.5 meters (20 inches) of soil by more than a factor of 5. The effectiveness of overburden in attenuating gamma radiation from a tailings pile is significantly greater than given in the DEIS. This bit of radiation physics can be corrected easily in any later version of the EIS. The FR81 is not affected.

9. LONGEVITY OF DISPOSAL STANDARDS

The FR81 requests "... comments on whether 1000 years is the best choice." In my view "disposal", without any form of surveillance, is impracticable. When the National Academy of Sciences' "Committee on Radioactive Waste Disposal" began in 1968 one of the very first actions we took was to change the name of our committee by substituting "Management" for "Disposal". We felt that, in the very long term, occasional surveillance would be essential, and that a walk-away-and-leave-it-alone policy as implied by "disposal" was impractical. I still feel that way. "Management" procedures and standards are practicable, "disposal" is impracticable.

Is there any person or group of persons who can predict the course of mankind on this continent for the next 200 years, let alone a millennium? Could George Washington have predicted the present state of commerce, population, communication, or the healing arts? The Pueblo of Los Angeles, California, was founded just 200 years ago, in 1781 "... with a population of twenty-six including Mexicans, negroes, and half-breeds ... upon the site of the old Indian village, Yang-na..."(E. B. Carter, "Hollywood, the Story of the Cahuengas", H.H.S. Press, 1926). Its LaBrea tar pits were a death trap, but have been "managed" successfully.

The very advanced Aztec civilization in Central America could not have foreseen its destruction by Cortes in 1519. And even the Norman Conquest of England ("1066 and all that") and the Magna Carta (1215) were less than 1000 years ago. At present the mortality from all forms of cancer is only about one-half of the morbidity. Who can say what the cure rate will be in 20 years, or 200 years?

For what it's worth, with Federal or State custody of the tailings sites planned under Section 202 of PL 95-604 after remedial action is completed, 100 to 200 years seems to me to be a more than adequate time span.

10. RADIUM IN SOIL

The proposed 5 pCi Ra/g soil standard seems reasonable if it is intended to apply to cover materials near the surface. But what is meant by the provision "... in any 15 cm thickness below 1 foot, shall not exceed 5 pCi/g" (para. 192.12(a))? To what maximum depth "below 1 foot" does this proposal apply, 5 ft, 20 ft, 1000 ft? If it's to any considerable depth then the radon flux might be 5 pCi Rn/m^2 · sec, - another reason for dropping the 2 pCi Rn/m^2 · sec concept.

11. RADIUM IN DRINKING WATER

FR81, in paragraph 192.03(b)(1) and Table A, repeats the EPA drinking water standard for combined radium-226 and radium-228 of 5.0 pCi/liter. As you know from prior correspondence and conversations I feel that this is unduly restrictive, inefficient in its cost/benefit ratio, and inflationary in the expenditure of manpower and money which it is causing. Other scientists who have had significant direct experience in the study of the radiobiological effects of radium share this view. If this is a time for reconsideration, please consider the following.

The effects of Ra-226 and Ra-228 in humans has been under quantitative experimental study for more than 40 years, and is probably the best understood of all radiobiological responses to low, intermediate, and high level radiation. The permissible body burden for Ra-226 was set at 0.1 µCi in 1941 based on all the cases which we had studied quantitatively up to that time (N.B.S. Handbook 27, NCRP Report No. 5). Now, 40 years and 2000 studied patients later, the 0.1 µCi Ra benchmark continues to be the solid basis for all radiation protection guides for radium in man by the

NCRP and the ICRP (e.g., NCRP Reports No. 11 (1953), No. 22 (1959), No. 39 (1971); ICRP Publication 2 (1959); Publication 30, Part I(1979)). This 0.1 μCi Ra standard does not depend upon any model of dose vs. response, or of estimated tissue doses in rad or rem. The Sr-90 and Pu-239 permissible levels were based upon this radium standard (ICRP Pub. 2).

The 0.1 μCi Ra bench mark was based on the directly measured residual body burden of patients, long after they had acquired a much larger initial burden, commonly the order of at least 100 times larger. When used as a radiation protection guide the 0.1 μCi bench mark represents not a residual burden but the maximum body burden reached during intake. Thus there is a substantial additional safety factor of between 1 and 2 orders of magnitude built into the conventional use of the 0.1 μCi Ra standard as the maximum body burden rather than as a residual body burden evaluated many years after exposure (see, for example, Figure 16 in R. D. Evans, "The Effect of Skeletally Deposited Alpha-Ray Emitters in Man". Brit. J. Radiol. 39, 881-895 (1966)).

The ICRP has given long and careful consideration to risk analysis, and to the risk associated with the ingestion of radium. Since the very first standards were proposed by ICRP and NCRP for internal emitters, radium standards have been based on the 0.1 μCi Ra benchmark while standards for other radionuclides have been based on calculations of rad, rem, Gray, and Sievert tissue doses.

The present ICRP occupational annual limit of oral intake (ALI) of radium is 70,000 Becquerels for Ra-226 and 90,000 Becquerels for Ra-228 (ICRP Pub. 30, Part 1, "Limits for Intakes of Radionuclides by Workers", page 99). For mixtures of Ra-226 and Ra-228 we may use the average, 80,000 Bq/yr, which is 220 Bq/day, or 6000 pCi/day.

The ALI and average daily intake were derived by using the alkaline earth retention model of John Marshall (ICRP Pub. 20) and determining what ALI for each of 50 successive years would result in a final body burden not to exceed 0.1 μCi Ra-226 (J. Vennart, Health Phys. 40, 477-484 (1981)).

This ALI of 7 to 9 x 10^4 Bq, or 2 x 10^6 pCi, already contains the considerable safety factor of 10 to 100 attributable to the use of maximum burden rather than residual burden, discussed above. If now an additional safety factor of 100 is applied for the general public as compared with radiation workers, the 6000 pCi Ra/day becomes 60 pCi Ra/day. The standard daily intake of drinking water is less than 1 liter/day (ICRP Pub. 23, page 360). But putting in still another safety factor by assuming 2 liters/day, leads to a value of 30 pCi Ra/liter as a very conservatively safe maximum permissible concentration for Ra-226 plus Ra-228 in drinking water.

Thirty pCi Ra/liter, expressed in S. I. units is 1 Bq/liter, which is the value adopted in Canada in 1978, prior to the publication of ALI values in ICRP Pub. 30. By coincidence, 30 pCi Ra/liter is the concentration which I recommended mostly on grounds of dosimetry and dose-response relationships in my 11-page commentary dated October 4, 1975 on EPA's 40CFR141, as well as in my letter of September 8, 1980

---

to William Lappenbusch of EPA's Office of Drinking Water. Those two commentaries led to the same recommendation as now results from ICRP's approach, which is happily independent of dosimetry or dose-response relationships.

In summary: based on long-term epidemiological studies and recent ICRP recommendations on annual limits of intake, raising the EPA drinking water standard for Ra-226 and Ra-228 from 5 pCi/liter to at least 30 pCi/liter can be shown to have a safety factor of at least 3 to 4 orders of magnitude with respect to the international radium MPBB standard of 0.1 μCi Ra. This can be shown without making any assumptions about the shape of the dose vs. response curve.

All of these comments are intended to be constructive. I hope they will be helpful. I will be glad to discuss any of these matters with you and your colleagues at any convenient time.

With best regards.

Cordially,

Bob

Robley D. Evans, Ph. D.
Professor of Physics, Emeritus
Mass. Institute of Technology

Robley D. Evans

RDE:mms

A-79-25
IV-D-54

RECEIVED
ENVIRONMENTAL PROTECTION
AGENCY
MAY 29 1981
CENTRAL DOCKET
SECTION

U.S. Environmental Protection Agency
Docket No. A-79-25
West Tower, Gallery 1
401 M Street, S.W.
Washington DC 20460

Gentlemen:

We wish to comment on the proposed standards for the cleanup and disposal of low-level radioactive wastes. We have studied the information made available to us from the Federal Register and feel that we are not qualified to comment extensively on the more technical matters discussed therein. No doubt these matters will be covered by environmental groups with more technical expertise than we have.

But we do have one important comment on what seems to us a glaring omission from the proposals we have seen. In our region, site of one of the 25 inactive uranium ore mills, near which new uranium mining is scheduled to begin soon, water is scarce, precious, and vital to the agricultural base of our state. The inactive mill here is located near the junction of a creek and a major river, the Cheyenne, and has for years been discharging wastes into both water sources, as well as into the surrounding air.

It is essential that any disposal methods take into careful consideration methods of protecting the ground and surface waters from exposure to these radioactive wastes. In addition, steps should be taken to remedy, insofar as is possible, the damage already done. Fish in the river, creek and a nearby dam may be contaminated, as may water sources of people living in the area. These matters need to be clarified, and measures taken to protect people and livestock from further contamination.

Thank you for the opportunity to comment on these proposed regulations.

Sincerely,

Lawrence Perry

Lawrence Perry
Secretary, Black Hills Energy Coalition

June 2, 1981

attn:
Environmental Protection Agency: A-79-25
IV-D-60

In re: Proposed Standards for Uranium Mill Tailings Radiation Control Act of 1978 and the Draft EIS

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JUN 12 1981
CENTRAL DOCKET
SECTION

person to person I'd like you to consider the human value involved in this decision. even one baby born with a preventable birth defect is too much. Radon daughters, the more powerful offspring in this case freely roam our state.

please implement the standards by the end of the year, the general public in New Mexico want our natural resources better protected.

consider the social responsibility of the uranium mill owners to clean up their own mess - if even possible! my children and I, and many townspeople of Taos appeal to you to enforce these standards. helene larson

A-90m 131

helene larson
box 565, Taos, new mexico 87571

A·79-25
IV-D-72

RECEIVED
ENVIRONMENTAL PROTECTION AGENCY
JUN 16 1981
CENTRAL DOCKET SECTION

TO: Environmental Protection Agency
FROM: Environmental Defense Fund
DATE: June 12, 1981
RE: Comments on Proposed Environmental Protection Standards for Uranium Mill Tailings, 40 CFR Part 192, 46 FR 2556-2563 (Jan. 9, 1981)

42 USC 2022(a), under which the proposed standards have been developed, requires that the Administrator of the Environmental Protection Agency promulgate regulations 'for the protection of the public health, safety, and the environment from radiological and non-radiological hazards associated with residual radioactive materials located at inactive uranium mill tailings sites and depository sites for such material.'

In order to satisfy the Congressional intent of 42 USC 2022(a), and the intention expressed in the Committee Report on the Uranium Mill Tailings Radiation Control Act, ("The committee does not want to visit this problem again with additional aid. The remedial action must be done right the first time." (H.R. Rep. No. 1480, 95th Cong. 2nd session page 40 (1978)), several changes are necessary to the proposed regulations.

(1) The proposed groundwater protection standards, 40 CFR 192.03(b), 46 FR 2562 (Jan. 9, 1981) which currently apply only to releases from tailings that may occur after disposal of the piles, should be changed to include protection from groundwater contamination prior to disposal of the piles. In Supplementary Information 45 FR 2560 (Jan. 9, 1981) it is stated 'it may sometimes be possible to improve the quality of an already contaminated aquifer, but we believe a generally applicable requirement to meet preset standards is not feasible.'

A generally applicable requirement that is feasible is therefore proposed for consideration as an addition to 40 CFR Part 192.03:

> When contamination of an underground source of drinking water is occuring from substances released from residual radioactive materials prior to disposal, action shall be taken (1) to prevent release of such substances and, (2) to restore groundwater quality to levels in Table A or to former quality levels before substances were released from residual radioactive materials, to the maximum extent practicable.

This addition is necessitated by 42 USC 2022(a) which makes no distinction between 'prior to disposal and 'after disposal' in requiring the EPA to promulgate standards for the protection of the public health, safety, and the environment.

(2) It is urged that proposed 40 CFR 192.03(b)(1) be amended to add:

> (b) substances released from residual radioactive materials after disposal will not cause (1) the concentration of that substance in an underground source of drinking water to exceed the level specified in Table A or TO EXCEED THE PRESENTLY EXISTING LEVEL IF LESS THAN THAT IN TABLE A.

The inclusion of such words is justifiable despite the language in Supplementary Information,46 FR 2599, (Jan. 9, 1981).

> "we are proposing to allow minimal degredation of very good quality water. There is no need for stricter standards than we are proposing, and substantial additional resources could be required to meet them for some piles."

Because of the tremendous uncertainty and potential dangers of even very low levels of exposure to radioactive substances, approval by the EPA of minimal degredation of very good quality water does not protect the public health, safety, and the environment and is therefore not within discretion authorized by the Uranium Mill Tailings Radiation Control Act of 1978.

Since the Administrator of the EPA may periodically revise any standard promulgated pursuant to 42 USC 2022(a), no degredation of an underground source of drinking water should currently be permissable. If it is determined in the future that there is no danger to the public health, safety, and the environment from extremely low levels of radiation, the Administrator of the EPA could then revise 42 CFR 192(b)(1) to its present language.

(3) Proposed 40 CFR 192.20(c), 46 FR 2563 (Jan. 9, 1981) should be eliminated.

Although this cost/benefit analysis can only be used when the values in Table B are only slightly exceeded, the language 'slightly exceeded' is to vague to be strictly enforceable, and seriously weakens the standards of Table B. Such a standard would not protect

Environmental Protection Agency
June 12, 1981
Page 3

the public health, safety, and the environment from radiological hazards, and is therefore impermissable under 42 USC 2022(a).

Respectfully submitted

Robt W. Lawrence

Robert W. Lawrence
Environmental Defense Fund

RWL:rc

A-79-25-IV-D-92

DARRELL R. FISHER, PH.D.
Radiation Biophysicist
1306 North Arthur Street
Kennewick, Washington 99336
(509) 735-3178

July 7, 1981

U. S. Environmental Protection Agency
Docket No. A-79-25
West Tower, Gallery 1
401 M Street S.W.
Washington, D.C. 20460

RE: Proposed Remedial Action Standards for Inactive Uranium Processing Sites (Federal Register--April 22, 1980, January 9, 1981)

Gentlemen:

Although the intended purpose of the proposed standards is to protect public health, safety, and the environment, the enactment of the above standards could easily result in the most cost-ineffective of any radiation protection program ever attempted in the history of mankind.

According to the U. S. Department of Energy, the proposed standards would cost the American taxpayers in excess of $1 billion to implement[1].

The health benefit of such remedial actions can be estimated, but the calculation is subject to many assumptions and approximations. A reasonable upper estimate of the number of premature health effects that could be prevented by implementation of the proposed standards is merely one to two deaths due to radon daughter-induced lung cancer per year[2].

In perspective, it is estimated that cigarette smoking in the United States is responsible for 300,000 premature deaths from lung cancer each year[3]. Using the risk coefficient adopted by Evans and others[4], approximately 3,500 lung cancer cases per year in this country may be attributed to naturally occurring "background" levels of radon daughter products in the air that we all breath--irrespective of the existence of inactive uranium tailings piles.

(continued)

Darrell R. Fisher

page 2
U. S. Environmental Protection Agency
July 7, 1981

On the basis of cost/benefit analysis, the proposed standards should not be implemented, and Public Law 95-604 should be reconsidered.

Respectfully yours,

Darrell R Fisher

1) Remarks by Robert W. Ramsey, Jr. (U. S. Department of Energy), "Implementation of DoE Remedial Action Programs," given at the 26th Annual Meeting of the Health Physics Society, Louisville, Kentucky, June 24, 1981.

2) U. S. Environmental Protection Agency, Draft Environmental Impact Statement (EPA 520/4-80-011), for remedial action at inactive uranium processing sites.

3) Lester Breslow, "Cigarette Smoking and Health," in Public Health Reports 95(5):451-455, September-October, 1980.

4) R. D. Evans, J. H. Harley, W. Jacobi, A. S. McLean, W. A. Mills, and C. G. Stewart, "Estimate of Risk from Environmental Exposure to Radon-222 and its Decay Products," in Nature 290(5802):98-100, March 12, 1981.

ESD 370

A-79-25
IV-D-1

ROCKY MOUNTAIN ENERGY COMPANY

ENVIRONMENTAL SERVICES
CLARK M BOLSER
MANAGER

April 21, 1980

RECEIVED
ENVIRONMENTAL PROTECTION AGENCY
APR 24 1980
CENTRAL DOCKET SECTION

Environmental Protection Agency
Central Docket Section, Room 2903B
401 M Street, S.W.
Washington, D.C. 20460

Dear Sirs:

Re: Docket No. A-79-25

The following are comments on the proposed remedial action standards for Inactive Uranium Processing Sites including Uranium Mill Tailings and Cleanup of Open Lands and Buildings.

It is assumed that the proposed Radon-222 flux following reclamation will be limited to 2.0 $pCi/m^2/sec$ above background levels. This is consistent with the proposed limit on Radon emissions for tailings disposal as per the Draft Generic Environmental Impact Statement (DGEIS) published by the Nuclear Regulatory Commission. The DGEIS further states, however, that Radon measurements taken in common soils in the western milling regions indicate that the upper range of flux is about 2 to 3 $pCi/m^2/sec$, (Appendix O). Therefore, the total flux for any particular tailings disposal site may approach 5 $pCi/m^2/sec$.

In contrast, it is stated for land cleanup that "the average radium concentration in any 5 centimeter thickness shall not be more than 5 pCi/gm after cleanup." This statement is very ambiguous and needs additional clarification. Despite the ambiguity, the Radon-222 flux resulting from 5 pCi/gm, using methods of Momeni, et. al. and Clements, et. al. (references 1 and 2) would be approximately 3 $pCi/m^2/sec$. This is within the statistical range of Radon-222 flux in the western states as referenced in the DGEIS. The inconsistency between the hypothetical Radon-222 flux from the tailings disposal site of 5 $pCi/m^2/sec$ and the land cleanup of 3 $pCi/m^2/sec$ raises questions concerning the real basis, rationale, and purpose of the proposed standards.

Further inconsistencies arise when considering the proposed standard for Indoor Radon decay product concentration of 0.015 WL, including background.

4704 HARLAN STREET DENVER COLORADO 80212 (303) 433-6841

Concentrations of Rn-222 inside structures resulting from diffusion of Radon-222 from underlying soil may be estimated by the following equation and assumptions from Reference 3:

$$C = \frac{\phi AB}{V\lambda}$$

where:

C = Radon-222 concentration (pC/m^3)

ϕ = Radon-222 flux ($pCi/m^2/sec$)

A = Area over which flux enters structure (m^2)

B = Flux reduction factor in entering structure

V = Volume of structure (m^3)

λ = Effective removal rate of Radon-222 from the structure

Calculations based on $B = 0.2$

$A/V = 0.41$, and 1 pCi/l Rn-222 = 0.005 WL

Table 1 shows the relationship between soil surface Radon-222 flux to working levels and effective removal rates (λ) within structures.

From Table 1 it can be seen that the Radon-222 flux over tailings disposal sites and land cleanup areas would result in 0.005 WL for ventilation rates of 1 per hour and 1.5 per hour. The proposed standard of 0.015 WL, including background, however, corresponds to Radon-222 fluxes of 10.2 and 15.2 $pCi/m^2/sec$ for the same ventilation rates.

Assuming that the ultimate goal of the proposed tailings disposal and land cleanup standards is protection of the public for health effects due to Radon progeny, and the criteria used that directly relates to health effects is the "most protective level which can be justified," it is unnecessary and extremely costly to industry to set limits on Radon-222 flux and Radium-226 concentration which would result in Indoor Radon progeny concentrations lower than the proposed standard of 0.015 WL.

Further, the proposed standard for remedial action of 0.015 WL, including background, is in contrast to the concentration limit of 0.03 WL above "background" levels proposed in 40 CFR 250.46-4 (reference 4) for exposure in residences built on reclaimed land. There does not seem to be adequate justification for the differences in these standards. In addition, the nature of radiation exposures in the environment is such that only distribution statistics can adequately describe any exposure condition. To be practical, the standards must include confidence limits for measurements, acceptable probabilities of exceeding specified limits or other statistical specifications.

Sincerely,

Dr. Lyda Hersloff

Dr. Lyda Hersloff
Environmental Specialist

LH/jdm

Attachments

cc: Clark Bolser

[illegible]

Table 1

[illegible]

[illegible]

	[illegible]	[illegible]	[illegible]
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REFERENCES

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[illegible]

Anaconda Copper Company
[illegible]
[illegible]
[illegible]

June 15, 1981

Dr. Stanley Lichtman
Criteria and Standards Division (ANR - 460)
Office of Radiation Programs
U.S. Environmental Protection Agency
Washington, D.C. 20460

Re: Docket No. [illegible]
Anaconda Copper Company's Comments to the EPA's Proposed Disposal Standards for [illegible] Processing Sites - Federal Register of January 9, 1981
46 FR [illegible]

Dear Dr. Lichtman:

The Anaconda Copper Company is pleased to [illegible] Environmental Protection Agency with comments [illegible]

[illegible]

[illegible]

[illegible]

The combination of these factors [illegible] standards proposed [illegible] adequate levels of protection.

Dr. Stanley Lichtman
June 15, 1981
Page 2

[illegible]

Sincerely,

[illegible]
[illegible] Director of Operations

[illegible]

Attachment

COMMENTS OF THE
[illegible]
TO THE ENVIRONMENTAL PROTECTION
AGENCY'S PROPOSED STANDARDS FOR
INACTIVE URANIUM PROCESSING SITES

I. Cost Analysis

[illegible]

[illegible] soil stabilization, are the major cost factors in taking remedial action, therefore, total cost estimates are extremely sensitive to errors in these factors.

Secondly, EPA has not included in the costs of remedial action several important activities which should be accounted for. These include costs for engineering, and general overhead including supervision and contingencies. Furthermore, EPA has not included in its cost impact analysis expenses for building demolition, decontamination of used equipment, general reclamation of mill site, or reclamation of borrow sites for soil or rip rap.

Combined, these errors in the estimated costs of remedial actions cause EPA's overall estimate to be low by as much as $600 million. This is a very significant difference which raises doubts as to the efficacy of the standards as proposed.

II. Standards for Remedial Action

A. Period of Effectiveness

The EPA has proposed that the remedial action must result in compliance with the standards for 1,000 years. Section 275(a) of the Uranium Mill Tailings Radiation Control Act requires EPA to develop standards for control of radiation from inactive uranium mill tailings sites which "to the maximum extent practicable are consistent with the requirements of the Solid Waste Disposal Act." We believe that requiring 1,000 years efficacy for remedial action on mill tailings is inconsistent which the policy approach the EPA has on proposed on February 5, 1981 for land disposal facilities (See 46 FR 11126). We recommend that the period of effectiveness be reduced to 50 to 100 years, which is comparable to the fifty year period proposed for land disposal facilities under RCRA. This represents a period of time during which it would be reasonable to expect that the standards would be met, given the use of state of the art technologies for reclamation.

B. Disposal Site Standards

The radon emanation standard of $2pCi/m^2$ - sec. appears to be based on returning radon flux levels at reclaimed mill sites to radiation background

[illegible]

this definition would include virtually all underground water sources. Yet water containing 1,000 to 10,000 TDS is generally considered brackish, and unsuitable as drinking water for humans. EPA's own drinking water regulations have a cutoff of 500 TDS. The definition in section 192.02(h) should be modified to establish a cutoff which truly defines the limits for TDS in portable water.

Second, the proposal would require that seepage from mill tailings ponds not cause water quality in surface or underground water to exceed the Interim Primary Drinking Water Standards for selected contaminants. Blanket adoption of these standards for remedial actions at inactive uranium mill sites is arbitrary as the Office of Radiation Programs has not based the need for this requirement on identified health hazards associated with releases of hazardous substances from inactive mill sites. In many cases, normal background levels of these contaminants exceed the minimum contaminate levels in the drinking water standards.

Finally, section 192.03(b)(2) and (3) would require that where current groundwater exceeds the allowable drinking water contaminant levels, the substances released from the disposal site will not cause the concentration of any harmful substance to increase. This requirement is excessive since it amounts to a nondegredation standard and ignors the fact that this water may never be used as a source of drinking water. Groundwater and surface waters ought to be protected to levels consistent with the existing or foreseeable uses for that water.

C. Standards Applicable to Open Lands or Buildings

EPA has proposed that the average concentration of radium-226, attributable to residual radioactive material from any designated processing site not exceed 5 pCi/gm for any 5 cm thickness of soil or other material within one foot of the surface and 15 cm thickness below one foot. This standard is based on two arguments, the validities of which are questionable. First, EPA has concluded that radon decay products greater than 0.01 WL pose an unacceptable health hazard. EPA has not adequately documented the designation of products greater than this level as posing an unacceptable health hazard. Furthermore, natural background levels may exceed the proposed

0.015 WL limit, which implies that EPA is, as with the groundwater protection standards, asking for control of contaminants beyond naturally occuring levels.

The second tenuous aspect of the 5pCi/gm standard is the conclusion that concentrations of radium-226 above that level will result in levels of radon decay product beyond 0.01 WL. As the American Mining Congress notes in its comments, there are several studies which raise serious questions about the appropriateness of this correlation. Levels of radium-226 as high as 20 pCi/gm near the surface and 70 pCi/gm to infinite depth below the surface yield annual exposure levels of about 0.02 WL. We concur with the Mining Congress's conclusion that EPA has not shown a need for the 5 pCi/gm standard for radium - 226.

With regard to the standards for radioactivity in occupied or occupiable buildings, again EPA has not adequately documented the need for a 0.015 WL indoor radon standard based on protection of public health or the environment. Further, though this standard purports to include the normal background level of 0.005 WL. Background levels are highly variable and could be as much as 0.03 WL. This brings into question both the achievability and enforceability of the EPA's standard.

To summarize, Anaconda Copper finds that EPA has underestimated the costs of meeting the standards proposed on January 9, 1981 at the 24 sites listed in the Uranium Mill Tailings Radiation Control Act. Those costs should be recalculated before the Administrator makes her final decision to promulgate standards. Further the EPA's scientific and technical justification for the standards for disposal sites and open lands are sufficiently in question to warrant a complete review of available information to reassess the need for public health and environmental protection standards as stringent as those proposed.

A-79-25
IV-D-74

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BY HAND

June 19, 1981

RECEIVED
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JUN 19 1981
CENTRAL DOCKET
SECTION

Environmental Protection Agency
Central Docket Section
West Tower Lobby
401 M Street, S.W.
Washington, D.C. 20460

Re: Proposed Disposal Standards for
Inactive Uranium Processing Sites,
Docket No. A-79-25

Gentlemen:

Please find enclosed two copies of comments on the above-referenced rulemaking proposal submitted on behalf of Kerr-McGee Corporation and Kerr-McGee Nuclear Corporation.

Very truly yours,

Ken Carroll

Kenneth E. Carroll

Encls.

BEFORE THE
ENVIRONMENTAL PROTECTION AGENCY

Re: Proposed Disposal Standards for Inactive Uranium Processing Sites, 46 Fed. Reg. 25566 (Jan 9, 1981)	Dkt. A-79-25

COMMENTS OF KERR-McGEE CORPORATION AND KERR-McGEE NUCLEAR CORPORATION

Peter J. Nickles
Charles H. Montange

Covington & Burling
888 Sixteenth Street, N.W.
Washington, D.C. 20006

Attorneys for Kerr-McGee
Corporation and Kerr-McGee
Nuclear Corporation

June 18, 1981

June 18, 1981

To: Environmental Protection Agency
Central Docket Section
West Tower Lobby
401 M Street, S. W.
Washington, D. C. 20460

Re: Proposed Disposal Standards for Inactive Uranium Processing Sites, Dkt. A-79-25, 46 Fed. Reg. 2556 (Jan. 9, 1981).

These comments, filed on behalf of Kerr-McGee Corporation and Kerr-McGee Nuclear Corporation (hereinafter "Kerr-McGee"), are addressed to the "Proposed Disposal Standards for Inactive Uranium Processing Sites," published by the Environmental Protection Agency (hereinafter "EPA" or "the Agency") at 46 Fed. Reg. 2556 (Jan. 9, 1981).[1] Kerr-McGee opposes the proposed standards as unreasonably and unnecessarily stringent and extravagantly costly. Kerr-McGee requests that they be withdrawn, and suggests that EPA propose new standards which are cost justified and reasonable in view of the very low potential risk posed by inactive sites.

Interest and Experience of Commenter

Kerr-McGee Nuclear Corporation operates a number of uranium mines, a uranium mill, and a uranium conversion facility.[2] Moreover, Kerr-McGee Corporation and Kerr-McGee Nuclear Corporation have formerly operated other nuclear fuel cycle facilities and non-fuel cycle facilities. Several of the facilities are currently in the process of being decontaminated and decommissioned.[3] In addition, decommissioning plans are being required by licensing authorities for Kerr-McGee's active uranium mill. Kerr-McGee accordingly has ample experience with respect to the costs and technology associated with decommissioning nuclear facilities, including source material processing sites.

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[1] The comment period originally expired on May 11, 1981. The period was subsequently extended through July 15.

[2] Kerr-McGee's Ambrosia Lake, New Mexico uranium mill is the largest such mill in the United States.

Summary

EPA's proposed inactive mill site standards are not supported by an accurate and responsible analysis of the risk which they are purportedly designed to avert. The agency attributes only two adverse health effects per year to radon from all inactive sites. This alleged risk is clearly "acceptable," particularly when weighed against other risks commonly and customarily assumed in our society. Moreover, the risk calculated by the agency overestimates the potential risk by a sizeable margin.

The costs imposed by EPA's proposed standards will be in excess of $500,000,000. This sum bears no reasonable relationship with the benefits likely to result from the standards. This is a tremendous sum to expend to eliminate

---

3/ For example, Kerr-McGee is in the process of decommissioning a small mixed oxide plant (Cimarron facility) and a plant previously employed to produce, among other things, thorium (West Chicago facility).

the two adverse health effects per year which the agency hypothesizes may occur in the absence of any regulation.

The 2 pCi/m^2-sec and the various groundwater protection standards proposed by EPA are unsupported, far too stringent, and in some cases inconsistent with analogous standards in other agency programs. In addition, the agency's 5 pCi/gm radium standard, .015 WL indoor radon restriction and proposed 1,000 year controls are arbitrary and unreasonable.

SPECIFIC COMMENTS

I. The Risk EPA Proposes to Regulate For All Practical Purposes Is Non-Existent.

EPA has identified release of radon-222 as the "principal health hazard" posed by inactive mill sites.[4] According to EPA's calculations, radon emanating from inactive tailings piles will result in 1.7 to 2.4 premature fatalities per year for a U. S. population of 200,000,000. This amounts to a risk of about 1 in 100,000,000. This figure is about equal to the risks posed by a "few puffs on a cigarette, a few sips of wine, driving the family car about 6 blocks, flying about 2 miles, canoeing for 3 seconds, or being a man

---

4/ Draft EIS for Remedial Action Standards for Inactive Uranium Processing Sites (40 C.F.R. Part 192) ("Draft Inactive Sites EIS") at S-4. EPA explicitly indicated that other radiological risks "are much less significant" than the risks posed by radon. *Id.* at 4-38. Indeed, the agency explained that "[a]t most, they increase by 10% the risk estimated for the regional population and the risk to the national population is much less." *Id.* EPA indicated that the impact of non-radioactive toxic substances on public health is site specific and that a risk assessment "cannot [be] constructed." *Id.* at 4-33.

aged 60 for 11 seconds."5/ This level of hazard is far less serious than other risks commonly and customarily accepted in our society.6/ Indeed, it is far less than risks ordinarily regarded as acceptable by other regulatory agencies.7/

5/ 46 Fed. Reg. 15167 (March 4, 1981).

6/ The following table sets forth a number of commonplace and customarily accepted risks of premature death:

Cause	Individual risk/year
smoker	1/300
agricultural employment	1/1,700
motor vehicle-Total (1975)	1/4,500
air pollution-sulphates	1/6,700
government employment	1/9,000
truck driving employment	1/10,000
falls	1/13,000
alcohol	1/20,000
living for 1 year downstream of a dam	1/20,000
motor vehicle-pedestrian (1975)	1,25,000
drowning - from recreational activities	1/53,000
inhalation and ingestion of objects	1/71,000
home accidents (1975)	1/83,000
bicycling	1/100,000
person in room with smoker	1/100,000
one pint of milk per day (aflatoxin)	1/100,000
accidental poisoning-solids & liquids	1/170,000
electrocution	1/200,000
vaccination for smallpox (per occasion)	1/330,000
air travel - one transcontinental flight per year	1/330,000

Source: OSHA Testimony of Professor Richard Wilson reprinted in Hutt, Unresolved Issues in the Conflict Between Individual Freedom and Government Control of Food Safety, 33 FD&C L.J. 558, 564-66 and 568 (1978). See also Cohen, et al., A Catalogue of Risks, 36 Health Physics 701 (1979). Copies of the OSHA testimony and the Cohen article are attached as Exhibit A.

7/ For example, NRC has explained that a risk of 1 in 1,000,000 is generally "acceptable." See NRC, Draft GEIS on Decommissioning Nuclear Facilities at 2-11 (Jan. 1981) (pertinent page attached as Exhibit B).

EPA's analysis indicates that the potential risk posed by radon from unregulated inactive piles is insignificant with regard to local or regional populations as well. For example, the potential risk to the regional population around Mexican Hat, Utah is, by EPA's calculations, approximately 1/28,000,000.8/

Another indication of the insignificance of the risk which EPA seeks to address derives from analysis of the annual release of radon from inactive sites in comparison to other sources of radon release.9/ The amount of radon attributable to inactive sites is a small fraction of the amount released by American agriculture due to soil tillage. It is even more miniscule in comparison to the amount of radon released from

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8/ This number is based upon EPA's data set forth in Draft Inactive Sites EIS at 4-14. Employing EPA's data, the greatest potential risk appears to be presented to the local populations of Gunnison and Grand Junction, Colorado. However, even the risk to those populations is less than many risks commonly accepted.

9/ The following table sets forth several significant natural or man-made sources of radon.

Source of Radon Release	Estimated Annual Release (Curies/Year)
Natural Soils	1.2×10^8
Evapotranspiration	8.8×10^6
Soil Tillage	3.1×10^6

NRC, Final Generic Environmental Impact Statement on Uranium Milling ("GEIS") 19.

natural soils.[10] Indeed, "[t]he total radon released from all inactive unstabilized uranium tailings piles is a minute fraction of the variations produced by meteorological conditions and agriculture in the total radon released by natural processes from all land areas."[11] For example, fluctuations in the level of the Great Salt Lake in recent years have had eight times as much effect on the amount of radon released into the Salt Lake City regional air as the annual release from the Vitro tailings pile located in the city.[12] In sum, the potential risk posed by radon release from inactive tailings piles is accordingly de minimis and for all practical purposes non-existent, even under EPA's analysis.

II. EPA's Risk Estimates for Radon Exposure Unreasonably Overstate Potential Adverse Health Effects.

EPA appears to rely on a number of different and inconsistent estimates for the potential adverse health effects posed by exposure to radon. These estimates vary from 3.0 to 11.1 in units of 10^{-4} per WLM.[13] The EPA estimates were

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[10] NRC has estimated that all mill-related releases will amount to less than 0.0005% of radon released from natural soils in the United States. GEIS at 6-68. At another point, NRC gives the estimate to be about 0.4%. GEIS 19 Table 5. Whichever is more correct, the amount is de minimis.

[11] Letter, Prof. Robley Evans to Dr. Mills (EPA) at 10, May 27, 1981.

[12] Id. at 9.

[13] Id. at 14.

evidently derived from an unpublished paper by V. E. Archer entitled "Factors in Exposure Response Relationships of Radon Daughter Injury."[14] However, the latest studies by leading experts indicate that the potential risk can be no greater than one in 10^{-4} WLM. See Evans, et al., Estimate of Risk from Environmental Exposure to Radon-222 and Its Decay Products, 290 Nature 98 (March 12, 1981) (Exhibit C). Thus, EPA's estimates concerning cancer risk from radon exposure are excessive by a factor of between 3 and 11. Consistent with EPA's stated policy of utilizing "the best available detailed scientific knowledge in estimating health impact when such information is available for specific types of radiation," EPA must adjust its risk estimates in accordance with the Evans paper. See 41 Fed Reg. 28409 (July 9, 1976).

EPA's health risk estimates are further defective in that they are evidently based upon a dispersion model, embodied in Table 4-2 of the Draft Inactive Sites EIS, which does not correspond to actual measurements. Measurements indicate that no radon above background can be detected at levels beyond 1/4 to 1/2 mile from an inactive pile.[15] The model also appears to assume incorrectly a 50% decay product equilibrium. These errors result in an additional overestimation of the local and regional risk posed by radon exhalation by a factor of up to ten.

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[14] This paper is cited in EPA, Draft Inactive Sites EIS at 4-40. Kerr-McGee notes that it is difficult if not impossible to frame meaningful comments on proposed radiation protection regulations when the agency does not identify the rationale behind its risk estimates. EPA has failed to set forth the rationale for the agency's various risk projections in the Draft Inactive Sites EIS. See also Letter, Evans to Mills (EPA), May 27, 1981 at 12-15 for a detailed discussion of inconsistency in EPA radon risk estimates.

EPA's analysis of radon risks is deficient for an even more fundamental reason. There is no clear evidence that exposure to radon in the low levels involved here will result in any risk to health at all. There is no discernible adverse human health effect from exposure to radiation from radon emanating from tailings piles, or, for that matter, other sources such as natural soils and agriculture. EPA evidently seeks to overcome this lack of evidence of adverse health effects by applying the so-called "linear non-threshold model." Employing this model, the agency has assumed that because very high doses of radiation are hazardous, there would be some potential ill health attributable to any exposure to ionizing radiation and that the magnitude of the effect is proportional to the dose received. The linear non-threshold model is based upon the assumption that tumor induction is a straightforward "one-hit" process in which any unit of exposure will result in some carcinogenic activity. This assumption is inaccurate.

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[15] See, e.g., Shearer & Sill, Evaluation of Atmospheric Radon in the Vicinity of Uranium Mill Tailings, 17 Health Physics 77-88 (1969) (Salt Lake City, Grand Junction, Monticello, and Durango) (attached as Exhibit D); Duncan, et al., EPA publication ORP/LV-77-1 (Grand Junction) (note contamination of certain sampling stations in the Duncan results). See Letter, Evans to Mills (EPA), May 27, 1981.

"[T]he bulk of evidence argues against the hypothesis that neoplastic transformation is a simple 'one-hit' process and therefore a linear function of dose." I Anderson, Pathology 347 (7th ed. 1977). Moreover, "[m]any radiation biologists are of the opinion that since body cells have a demonstrated capacity for repair there may well be a threshold dose below which the damage is much below linear, possibly zero." In re Duke Power Co. (Perkins Nuclear Section, Units 1, 2, and 3), 8 NRC 87, CCH Nuclear Reg. Rep. [1975-78 Transfer Binder] ¶ 30,312 at p. 28,669 (Licensing Board) (July 14, 1978). The agency's total reliance on the linear non-threshold model is thus unduly conservative and overstates the risk posed by radon exhalation.[16]

III. The Costs Which Will Be Imposed by EPA's Proposed Standards Bear No Reasonable Relationship to the Benefits Which May Be Derived.

Kerr-McGee understands that the Department of Energy ("DOE") currently estimates that a remedial action program at the 23 inactive sites under EPA's standards will cost at least $500,000,000 and probably more than $700,000,000 to complete. Kerr-McGee's own estimates are in accord, particularly since DOE is being pressured to relocate and dispose of some piles (e.g., the Vitro pile in Salt Lake City) below grade. The costs imposed by the proposed standards are not all monetary in nature: the earthwork and trucking involved in achieving EPA's standards will involve substantial risks to workers and to the public. For example, Kerr-McGee understands that remedial action at Salt Lake City may take five lives and cause over sixty injuries. This is a tremendous cost in view of the de minimis risk posed by inactive sites. It amounts to many millions of dollars and many serious injuries (up to and including fatalities) per hypothetical health effect averted. This expenditure of resources is manifestly unreasonable in view of the miniscule nature of the potential risks posed and the other much more valuable uses to which the funds and manpower may be put in our society. Put another way, the high costs associated with the EPA standards do not stand in a reasonable relationship to the benefits which can be reasonably attributed to compliance with the standards. Indeed, the substantial costs clearly outweigh the slight and hypothetical benefits. Moreover, EPA's proposed standard is not a cost effective means of preventing actual fatalities.[17]

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[16] The linear non-threshold model is even more suspect with respect to low-LET radiation such as gamma radiation. See NAS, The Effects on Population of Exposure to Low Levels of Ionizing Radiation (1980) ("BEIR III Report"); Boice, Cancer Following Medical Irradiation, 47 Cancer 1081, 1088 (1981). Thus, EPA's risk estimates for gamma radiation (see Draft Inactive Sites EIS at 4-29) are especially excessive in their projection of potential cancer fatalities.

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[17] In adopting 40 C.F.R. Part 190, EPA indicated that it believed that it was reasonable to expend $200,000 to $500,000 to avert a potential adverse health effect due to radiation exposure. See EPA, Indoor Radiation Exposure Due to Radium-226 in Florida Phosphate Lands 60 (1979). In its inactive site standards, EPA is essentially requiring the expenditure of at least ten times that amount per health effect averted. (The $500,000,000 cost if invested, would yield at least 1% per year -- 5,000,000 -- in real interest. The agency estimates approximately two fatalities per year. This works out to $2,500,000 per potential health effect averted in perpetuity.) The agency offers no rationale for this dramatic increase in expenditures to avert hypothetical health effects.

EPA largely failed to analyze the costs imposed by its proposed standards in comparison to their expected benefits. Indeed, the agency largely eschewed any analysis of the costs or benefits associated with its proposed water protection criteria at all. This failure is inconsistent with EPA's specific adoption of a cost-effectiveness approach in developing the radiation protection standards set out in 40 C.F.R. Part 190. See 40 Fed. Reg. 23421 (May 29, 1975) (column 1). It is also inconsistent with EPA's acknowledgement that use of the linear non-threshold hypothesis requires the agency to "weigh not only the health impact but also social, economic and other considerations associated with the activities addressed." 41 Fed. Reg. 28409 (July 9, 1976).

EPA's failure to consider costs is additionally inconsistent with the policy set forth in Section 2 of Executive Order 12291, 46 Fed. Reg. 13193 (Feb. 17, 1981). That Section directs federal agencies to "adhere to the following requirements:

> "(a) Administrative decisions shall be based on adequate information concerning the need for and consequences of proposed government action;
>
> "(b) Regulatory action shall not be undertaken unless the potential benefits to society from the regulation outweigh the costs to society;
>
> "(c) Regulatory objectives shall be chosen to maximize net benefits to society;

"(d) Among alternative approaches to any given regulatory objective, the alternative involving the least net cost to society shall be chosen; and

"(e) Agencies shall set regulatory priorities with the aim of maximizing the aggregate net benefits to society, taking into account the condition of the particular industries affected by the regulations, the condition of the national economy and other regulatory actions contemplated for the future."

EPA's proposed standards transgress each of the requirements specified in the Executive Order.

IV. EPA's Proposed Radon Flux and Water Standards Are Not Supported.

A. EPA's 2 pCi/m^2-sec Radon Emanation Standard Is Unreasonable

EPA proposes to limit radon emanation from inactive tailings piles to no more than 2 pCi/m^2-sec. This standard is unreasonably low. It is far less than levels emanating from natural outcroppings in areas where uranium is mined and milled. It essentially requires reduction of radon flux to the average levels ordinarily encountered in nature. It amounts to an effort to reduce a potential risk which the agency estimates is 1 in 100,000,000 to a possible risk which is about 1 in 10,000,000,000 or less.[18/] This amounts to insistence on risk-free disposal of the tailings. Such absolutism has consistently "been rejected by the courts." *North Anna Environmental Coalition* v. *NRC*, 553 F.2d 655, 665 (D.C. Cir. 1976). Neither the Atomic Energy Act nor regulations

promulgated under it require risk-free regulation of the nuclear fuel cycle. "We do not live in a risk-less society nor could modern technological societies exist on that basis." *Nader* v. *NRC*, 513 F.2d 1045, 1050 (D.C. Cir. 1975).

EPA's rationale for the stringent 2 pCi/m^2-sec limit is unconvincing. The agency simply notes that reducing radon flux to this level will eliminate 99.6% of the risk posed by radon emanation from inactive sites. EPA fails to acknowledge, however, that this reduction in radon flux is for all practical purposes irrelevant because the risk posed by radon from inactive sites is *de minimis* in the first place. EPA also claims that the 2 pCi/m^2-sec limitation will cost only about 10% more than standards limiting radon exposure to 10 to 40 pCi/m^2-sec. The agency has not established that any radon emanation standard is justified, much less one as low as 10 to 40 pCi/m^2-sec. Thus even if a 2 pCi/m^2-sec standard can be achieved at only slightly more expense than a 10 to 40 pCi/m^2-sec standard, the lower standard is nevertheless not justifiable. In any event, 10% of $500,000,000 (the minimum total cost to comply with EPA's standards) is $50,000,000 and the agency should not lightly dismiss such costs without analysis of the benefits expected from the additional expenditure. Even more to the point, however, is Kerr-McGee's experience with decommissioning. That experience indicates that the cost for reclamation will increase 10% for *each* additional reduction in radon emanation of 1 pCi/m^2-sec below 25 pCi/m^2-sec.

[18/] *See* Draft Inactive Sites EIS at 8-7 (proposed radon standard "would reduce radon emissions and their possible effects by 99%").

B. EPA's Groundwater Protection Standards Are Wholly Arbitrary and Unsupported.

EPA proposes to protect any "underground source of drinking water" ("USDW") from contamination due to release of chemicals from inactive sites. The definition of "USDW's" is therefore critical. The agency proposes to define "USDW" to include any aquifer containing less than 10,000 mg/l TDS. This definition is contrary to common sense, since aquifers with 4,000 mg/l TDS, or even less, are unfit for human consumption. Since it is technically difficult and quite expensive to treat water to decrease its TDS content, it is unlikely that water with 4,000 mg/l TDS or greater will ever be used for drinking water purposes. EPA's only explanation for this standard is that it "is based on the Safe Drinking Water Act and its legislative history, which reflects Congressional intent that aquifers in that class deserve protection."[19/] But nothing in the Safe Drinking Water Act ("SDWA") requires or provides for protection of all aquifers with less than 10,000 mg/l TDS. Moreover, the legislative history for the SDWA is totally bereft of any scientific or technical rationale for a 10,000 TDS standard. The SDWA thus lends no support to the definition EPA proposes here.

EPA's definition is in fact even more stringent than the definition of USDW adopted by the agency for purposes of the SDWA. In its UIC regulations, EPA has provided a means to

exempt aquifers from USDW status. For example, if an aquifer or portion thereof is not currently employed as a source of drinking water and if the aquifer is mineral producing, then it may be exempted from USDW status and contaminated without constraint. See 45 Fed. Reg. 42502 (June 24, 1980), promulgating § 146.04. EPA has made no provision for exempt aquifers in its proposed inactive site standards. The agency is thus in the strange position of proposing to require the Department of Energy to prevent contamination of an aquifer from an inactive site while private parties and government agencies are in the process of lawfully contaminating the aquifer (because it is "exempt") from other sources.

EPA also proposes to adopt certain contaminant limits suggested in the National Interim Primary Drinking Water Regulations ("NIPDWR"). These limits would apply to arsenic, barium, cadmium, chromium, lead, mercury, nitrate, selenium and silver. EPA's only stated reason for this wholesale adoption of the NIPDWR is that these standards allegedly "provide the best current guidance of adequate protection levels for drinking water." EPA overlooks the critical fact that the NIPDWR in question are applicable only to "community water systems" whereas EPA's proposed standards are applicable to groundwater which may never be used for drinking at all.

The NIPDWR standards for the chemicals in question were specifically designed for "community water systems." See

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19/ Draft Inactive Sites EIS at 8-16 to 17.

40 C.F.R. §§ 141.11 & 141.17.[20] "Community water system" is defined for NIPDWR purposes as "a public water system which serves at least 15 service connections used by year-round residents or regularly serves at least 25 year-round residents." See 40 C.F.R. § 141.2(e)(i). EPA's proposed inactive site water standards, in contrast, will be applicable (if adopted) not to community water supply systems but instead at any distance greater than 1.0 kilometer if the disposal site is a depository site. The proposed standards would thus apply to water which was not being employed for drinking water purposes and which might never be so employed. General application of stringent standards designed for "community water systems" to underground aquifers is not logical and is obviously wasteful of society's resources. Moreover, such application is inconsistent with existing state programs which apply drinking water standards only at the place where water is actually used or may reasonably be expected to be used for drinking water (e.g., New Mexico Water Quality Regulations). EPA has absolutely no basis for applying standards designed for "community water systems" to groundwater in underground aquifers as proposed in the regulations.

EPA's proposed incorporation of the NIPDWR standards is flawed for another general reason: many of the limits set

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[20] The nitrate standard is applicable to "non-community water systems" but these are defined as "public water systems" with at least 15 service connections or which serve at least 25 people daily 60 days out of the year. 40 C.F.R. § 141.1(e).

in the NIPDWR are arbitrary and are not required to assure that water is safe for human consumption. A prime example is the NIPDWR limit for selenium -- 0.01 mg/l. This stringent limit evidently had its genesis in early fears that selenium was carcinogenic. These fears have not been borne out.[21] To the contrary, selenium now appears to be anti-carcinogenic in both animals[22] and humans.[23] Moreover, research has disclosed that selenium is an essential trace element in human and animal nutrition.[24] It is a constituent of an enzyme, glutathione peroxidase, which "reduces hydrogen peroxide to water and hence protects the cell membrane and hemoglobin from oxidative damage and hemolysis. The actions of selenium are linked closely to those of vitamin E, and selenium has a sparing effect on vitamin E requirements."25/ Selenium is commonly found at levels far in excess of the NIPDWR standard in human urine and blood, particularly in seleniferous zones. No adverse impact has been associated with these levels. There does not appear to be a single report of acute selenium intoxication in the past half century.

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[21] As EPA has elsewhere noted, "The 1962 Drinking Water Standards Committee lowered the limit for selenium in drinking water [to 0.01 mg/l] primarily out of concerns over the carcinogenic properties of the element. Data supporting the carcinogenicity of selenium has not been forthcoming . . . ." EPA, Appendix A -- Drinking Water Regulations 113.

[22] E.g., Shamberger, Relationship of Selenium to Cancer. I. Inhibitory Effect of Selenium in Carcinogenesis, 44 J. Nat'l Cancer Inst. 931 (1970) (contained in Exhibit E).

[23] E.g., Shamberger, et al., Selenium Distribution and Human Cancer Mortality, 2 CRC Critical Reviews in Clinical Laboratory Sciences 211 (1971) (contained in Exhibit E); Shamberger, et al., Antioxidants and Cancer I. Selenium in the Blood of Normals and Cancer Patients, 50 J. Nat'l Cancer Inst. 863 (1973) (contained in Exhibit E). See also Goyer, et al., Toxicology of Trace Elements 211-13 (1977) (cited by EPA).

[24] Hambridge, Trace Elements in Pediatric Nutrition, 24 Advances Pediatrics 191, 225; van Rij, et al., Selenium Deficiency in Total Parenteral Nutrition, 32 Am. J. Clin. Nutrition 2076 (1979) (contained in Exhibit E).

EPA suggests that "bad health, gastrointestinal disturbances and skin discoloration have been associated with consumption of 0.01 to 0.1 milligrams of selenium per kilogram of body weight per day."26/ However, this association, even if valid, does not support a .01 mg/l limit. Consumption of 0.01 to 0.1 mg/kg corresponds to consumption of .7 to 7 mg of selenium per day for a 70 kg man. Such a man would likely consume only 2 liters of water a day, or 0.02 mg of selenium under EPA's standard. This is 1/35 the amount EPA claims may be toxic. This is an unreasonable margin of safety.

Even more significantly, EPA's fears concerning .7 to 7 mg of selenium in the diet now appear to be discredited, and there is increasing evidence that the low NIPDWR selenium standard may contribute to life threatening selenium deficiency. Selenium deficiency has recently been linked to Keshan disease, a sometimes fatal endemic cardiomyopathy of children which is prevalent in China.27/ A recent case was reported involving a two-year old Long Island girl.28/ After a massive study involving over 26,000 children, Chinese researchers recommended consumption of supplemental selenium in the amount of 0.5 mg/week for 1 to 5 year olds; 1.0 mg/week for 6 to 10 year olds; 1.5 mg/week for children over 11 and 4 mg/week for adults in order to prevent the disease. The researchers reported no harmful side effects after continuous administration of the supplemental selenium for three to four years. They also concluded "that the dosage was a safe one."29/ This dosage is far in excess of EPA's NIPDWR limit which would result in weekly adult consumption of only .14 mg of selenium and weekly consumption by children of about half that. The Chinese findings appear to be corroborated by some of the Agency's own references. One refers to animal studies indicating that "[a] range of 0.04 to 0.1 mg/l in the diet" is important to protect against selenium deficiency.30/ The very

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25/ Hambridge, supra note 24.

26/ Draft Inactive Sites EIS at C-9, citing EPA, National Interim Primary Drinking Water Regulation, EPA-570/9-76-003.

27/ Keshan Disease Research Group, Epidemiologic Studies on the Etiologic Relationship of Selenium and Keshan Disease, 92(7) Chinese Med. J. 477 (1979) (contained in Exhibit B).

28/ Collipp, et al., Cardiomyopathy and Selenium Deficiency in a Two-Year-Old Girl, 304 N. Eng. J. Med. 1304 (1981) (congestive heart failure [illegible] intake of only .01 mg of selenium per day) (contained in Exhibit B); see also Johnson, et al., An Occidental Case of Cardiomyopathy and Selenium Deficiency, 304 N. Eng. J. Med. [illegible] (contained in Exhibit B).

29/ Keshan Disease Research Group, Observations on Effect of Sodium Selenite in Prevention of Keshan Disease, 92(7) Chinese Med. J. 471, 476 (1979) (contained in Exhibit B).

30/ EPA, Appendix A to Drinking Water Regulations at 115.

low NIPDWR standard for selenium thus may actually contribute to adverse health effects caused by selenium deficiency. The NIPDWR standard is certainly insufficiently supported to be extended by the agency to cover inactive sites as proposed here, particularly in view of the new evidence on selenium deficiency.

EPA has also proposed to adopt the NIPDWR standards for radium and gross alpha particle activity for the inactive site regulations. The NIPDWR standard for combined radium-226 and radium-228 is 5 pCi/l; the standard for gross alpha particle activity (including radium-226 but excluding radon and uranium) is 15 pCi/l. See 41 Fed. Reg. 28404 (July 9, 1976). The EPA proposal is inconsistent with NRC's regulation governing release of radium and other alpha emitters to unrestricted areas. NRC's standards are set forth in 10 C.F.R. Part 20, Appendix B. EPA has in fact endorsed those standards in its definition of "radioactive waste" for purposes of the underground injection control ("UIC") program under the SDWA. See 45 Fed. Reg. 42502 (June 24, 1980), promulgating 40 CFR § 146.03 (incorporates 10 CFR Part 20, Appendix B, Table II, Col. 2 limits). For UIC purposes, EPA is thus permitting release of up to 30 pCi/l Radium-226 and up to 10 pCi/l Radium-228 before an effluent even falls within the definition of radioactive waste material. EPA has given no explanation why inactive sites must comply with more stringent standards.

EPA's inactive site proposals also include a standard for molybdenum even though that chemical is not covered

in the NIPDWR. The agency's proposed molybdenum standard -- .05 mg/l -- is totally arbitrary and unsupported. EPA's analysis fails to take into proper account the substantial evidence that molybdenum is not a significant health hazard. The apparent toxicity of molybdenum ingestion is on the order of potassium salts, i.e., very low. Molybdenum poisoning has been rarely observed in man.31/ Industrial populations have been exposed to levels as high as 50 mg/day without ill effects. Molybdenum is very rapidly absorbed and rapidly excreted in urine. This appears to be an effective mechanism for regulating blood and other tissue concentrations of the element.32/ EPA cites one study (by Chappell, et al.) for the proposition that "[c]hronic toxicity has been seen in persons who have consumed 10 to 15 milligrams of molybdenum per day."33/ So far as Kerr-McGee is aware, this is the only study which has purported to find adverse chronic effects from molybdenum exposure. Even if this study is indicative, it hardly accounts for a standard set at the extremely low level of .05 mg/l as proposed by EPA. The basis for the agency's proposed standard is thus again obscure. Perhaps it is predicated on a purported finding that increased copper excretion may occur if daily

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31/ NAS, Drinking Water and Health 282 (1977) (cited by EPA).

32/ Chappell, et al., Human Health Effects of Molybdenum in Drinking Water 3-4 (1979) (EPA-600/1-79-006) (cited by EPA).

33/ Draft Inactive Sites SIS at C-7 citing Chappell, et al., Human Health Effects of Molybdenum in Drinking Water, EPA-600/1-79-006, 1979).

intake of molybdenum exceeds .5 mg/day. However, no clinical effects have been reported for intake of molybdenum in amounts up to twenty times that amount.34/ Moreover, EPA overlooks the conclusion in the Chappell study that "[i]t is not likely that a drinking water standard for molybdenum is required."35/

EPA also proposes a 10 pCi/l standard for uranium. Like molybdenum, the NIPDWR specify no standard for this chemical. EPA offers no support for its 10 pCi/l proposal. Employing conservative assumptions, the agency notes that chronic chemical toxicity may result if humans drink water containing about 315 micrograms of uranium per liter.36/ However, this amount of uranium would be equivalent to 215 pCi/l uranium -- not 10 pCi/l. The 10 pCi/l figure specified by EPA is thus totally arbitrary. It cannot be adopted.

Kerr-McGee believes that specific groundwater standards are not required for inactive sites. Most such sites are located in an arid climate where it is unlikely that significant seepage from the piles can occur. This being the case, the piles are unlikely to cause any significant or hazardous contamination of drinking water supplies. Such problems as do arise may be addressed on a case-by-case basis by the Department of Energy taking into account all relevant factors. EPA has in fact acknowledged that potential ground-

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34/ See id., at 4.

35/ Id., at 5.

36/ Id., at C-12.

water contamination problems are site specific in nature and not amenable to being addressed on a generic basis.37/

IV. EPA's 5 pCi/gram Radium Standard Is Unreasonable

EPA proposes to limit the average concentration of Ra-226 at processing sites to 5 pCi/gram per 5 cm thickness within one foot of the surface and to 5 pCi/gram per 15 cm thickness below one foot. These limits fall well within the range in which Ra-226 is customarily encountered in the natural soils where uranium is milled. The proposed levels are clearly not necessary for the protection of public health, since EPA admits that under the 5 pCi/gram standard, a person living continuously atop the "contaminated" soil would be exposed to only about 80 mrem of radiation per year.38/ Eighty mrem is less than the natural background level of radiation to which all persons are exposed in the United States and far less than the amount to which persons in western mining areas are exposed.39/

37/ Id. at 4-33.

38/ Id. at 8-23. EPA's 80 mrem estimate is based upon a 100% occupancy assumption which is, of course, unrealistic. A person working outdoors would be expected to occupy a site for only 20-30% of the time, not 100%. Moreover, a concrete house slab would reduce the [illegible] by at least a factor of 2-3 for a person living at the site. Kerr-McGee believes that a better estimate for gamma dose from radium-226 would be 15 mrem/year based on continuous occupancy or 5 mrem/year based on realistic outdoor occupancy for two reasons: (1) Ra-226 from material deposited [illegible] decreases with depth thus markedly decreasing dose and (2) radon emanation removes major gamma-emitting daughters (Pb-214 and Bi-214) from the soil matrix.

39/ Average natural background radiation (cosmic, terrestrial and internal body radiation) varies from State to State between

(footnote con't)

The proposed Ra-226 standard is in fact so low that it will be difficult if not impossible to achieve as an engineering matter.

V. EPA's Proposed Indoor Radon Standard Is Unreasonably Stringent

EPA proposes to limit indoor radon concentration to no greater than .015 WL. This is a marked departure from the Surgeon General's existing guidelines governing the Grand Junction clean-up program. Those guidelines do not require remedial action unless the indoor radon concentration exceeds .05 WL.[40] Even the Surgeon General's .05 WL standard is unduly stringent in view of studies indicating that use of tailings in building construction have not resulted in any excess levels of leukemia or lung cancer.[41] As already indicated, the agency has overstated the risk from radon by a factor ranging from 3 to 11. This suggests that the EPA

(footnote cont'd)

approximately 90 mrem and 180 mrem average exposure per year. Variation is caused primarily by different altitudes above sea level and by natural rock formations. Living near a granite rock formation, for example, may result in 25 to 100 mrem additional exposure per year. See Low-Level Ionizing Radiation, Hearings Before the Subcommittees on Energy Research and Production and Natural Resources and Environment of the House Committee on Science and Technology, 96th Cong., 1st Sess. at 8-9 (1979); Biological Effects of Radiation, 15 Encyclopedia Britannica 382 (1979). There is no evidence that this background radiation has had any adverse effect upon the population.

[40] EPA, Indoor Radiation Exposure Due to Radium-226 in Florida Phosphate Lands 77 (1979) (520/4-78-013).

[41] See NRC, Generic EIS on Uranium Milling A-35.

standard is too low by a similar factor. The unreasonableness of the EPA standard is further demonstrated by the agency's admission that naturally occurring indoor radon concentrations exceed .015 WL in over ten percent of the homes with basements surveyed in Grand Junction, New York, and New Jersey.[42] The EPA standard thus appears to call for reduction of indoor radon below commonly occurring levels. No standard should be established until research has been completed to establish natural background indoor radon levels in the areas where inactive sites are located. Compare National Lime Association v. EPA, 627 F.2d 416, 454 (D.C. Cir. 1980) (duty to collect relevant data).

EPA's approach to indoor radon in its proposed standards is in sharp contrast to the agency's past practices. In its Florida Phosphate study, the agency noted that under existing Federal Guidance, traditional ALARA principles were applicable.[43] Under these principles the possible benefits from a further reduction in exposure must be balanced against the costs for the reduction. EPA's analysis supporting its proposed indoor radon limits is largely bereft of such analysis. EPA has offered no rationale for departing from traditional ALARA principles in issuing these standards. No indoor radon standard should be established until the agency has completed an adequate analysis of its risks and costs.

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[42] Draft Inactive Sites at EIS 8-27 (1980). Indeed, a recent study indicated that indoor radon concentrations may commonly be in the range of 12 to 33 pCi/l (.13 WL to 1 WL using the conversion factor set forth in 10 CFR Part 20, App. B, footnote 3) -- levels far in excess of EPA's proposed limits. See Rundo, et. al, Observation of High Concentrations of Radon in Certain Homes, 36 Health Physics 729 (1979) (attached as Exhibit F). Moreover, we understand the DOE has informed EPA that it appears that 55 percent of the basements and 30 percent of the first levels in U.S. homes exceed 0.015 WL. Letter, R. Clusen (DOE) to D. Hawkins (EPA), Feb. 15, 1980. In addition, NRC has noted that over 30 percent of the structures already decontaminated at Grand Junction still exceed 0.015 WL. Id. See also Letter, Clusen (DOE) to Costle (EPA), June 13, 1980.

[43] EPA, Indoor Radiation Exposure Due to Radium-226 in Florida Phosphate Lands 77-78 (1979) (520/4-78-013).

VI. EPA's Standards Should Be Based on Management of Tailings, Not Perpetual Disposal

EPA proposes to require controls creating "a reasonable expectation" that the agency's standards will be met for at least 1,000 years. See 46 Fed. Reg. 2562 (Jan. 9, 1981). EPA admits that this choice is at least "partly arbitrary."[44] It is also manifestly unreasonable as a design requirement for appropriate controls. History is bereft of significant examples of controls capable of surviving for that period of time on so large a scale as proposed here. Thus, the very availability of 1,000-year controls is unproven and sheerly speculative.

EPA's 1000-year control proposal is deficent for another reason. It is evidently based upon the erroneous and unsupportable assumption that the government will fail. EPA's assumption is inconsistent with Congress' action in providing for government custody of stabilized tailings sites. Congress took that action on the assumption that the government would

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[44] Draft Inactive Sites EIS at 8-20.

assure the security of the sites in question. In addition, EPA's assumption that the government will fail is contrary to our Constitution which provides for continuity of government.[45] The underlying rationale for EPA's 1000 year controls is thus fundamentally unlawful.

1,000-year controls will be a colossal and unrecoverable waste of resources to the detriment of current and future generations, particularly if fears concerning low-dose radon radiation are not borne out or if effective treatment for pertinent adverse health effects is developed. Either of these eventualities is a very real possibility. Under the circumstances, stabilization to control inactive site erosion for the next 50 to 100 years will be fully adequate to protect the public and will be sufficiently conservative as well. EPA should require no more under the circumstances. Since the

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[45] Chief Justice Marshall explained in Marbury v. Madison, 5 U.S. (1 Cranch) 137, 2 L.Ed. 60 (1803) that "[t]he [Constitution's] principles . . . so established, are deemed fundamental. And as authority from which they proceed is supreme, and can seldom act, they are designed to be permanent." A Civil War was fought over this issue, and as President Lincoln in the First Inaugural Address (March 4, 1861) observed:

> "A disruption of the Federal Union heretofore only menaced, is now formidably attempted. I hold, that in contemplation of universal law, and of the Constitution, the Union of these States is perpetual. Perpetuity is implied, if not expressed, in the fundamental law of all national governments. It is safe to assert that no government proper, ever had a provision in its organic law for its own termination." IV Collected Works of Abraham Lincoln 264 (R.P. Basler, ed., 1953).

I-4

UMTRC Act provides that the inactive sites in question will be under government ownership and control, the costly clean-up program EPA's proposed standards envision may be undertaken at a later time if new information indicates that such steps should be taken.

Conclusion

For the reasons stated in these comments and in other comments filed in this proceeding, the proposed inactive site regulations should be withdrawn and reproposed only after appropriate modifications to assure that they are reasonable and that the benefits associated with them will exceed their cost.

Respectfully submitted,

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I-5

ROCKY MOUNTAIN ENERGY
A Subsidiary of
Union Pacific Corporation

Ref: jm 136/81

A-79-25
IV-D-85

July 2, 1981

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Docket No. A-79-25
Central Docket Section
U.S. Environmental Protection Agency
401 M Street SW
Washington, D.C. 20460

Re: Proposed Disposal Standards for Inactive Uranium Processing Sites; 40 CFR Part 192, Federal Register January 9, 1981

Gentlemen:

Rocky Mountain Energy has reviewed the proposed disposal standards for inactive uranium processing sites, 40 CFR 192, published in the Federal Register January 9, 1981. We would like to take this opportunity to provide comments on the regulations. In particular, we would like to comment on Part VI which among other criteria, sets forth maximum allowable concentration levels for molybdenum and uranium in any "underground source of drinking water" within 1.0 kilometer of an inactive uranium processing site.

EPA Jurisdictional Authority

EPA cites Section 275(a) of the Atomic Energy Act (added by the Uranium Mill Tailings Radiation Control Act of 1978) as justification for its authority to develop standards for the disposal of uranium process materials. The Act, however, specifies that the program shall be developed to control tailings in an environmentally sound manner and to "minimize or eliminate . . . health hazards to the public." EPA should, therefore, base its regulations on the actual or potential effects uranium process materials may have on human health.

EPA has not shown that the proposed standards are necessary to safeguard public health. In particular, the criteria for molybdenum and uranium in ground water appear to be poorly chosen. To our knowledge no definitive scientific data has been published to prove that molybdenum levels of 0.05 mg/l or uranium levels of 10pCi/l (approximately 0.015 mg/l) are injurious to humans. In fact, the current maximum allowable level of uranium in domestic sources of water in Wyoming is 5 mg/l or a factor of 40 above the proposed standard.

Unconventional Drinking Water Standards

Since the purpose of the regulations is to protect "underground sources of drinking water" as they affect human

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health, it is clear that the molybdenum and uranium standards are intended as informal drinking water standards. To our knowledge, no previous drinking water limits have been established for these parameters. We feel that this unconventional approach to establishing drinking water standards is unacceptable.

In the development of the Primary and Secondary Drinking Water Standards, EPA reviewed a sizeable volume of scientific information. This information was evaluated and reevaluated under public scrutiny before the final standards were established. (For example, see Water Quality Criteria, 1972, a Report of the Committee on Water Quality Criteria and Quality Criteria for Water published in 1976). We feel EPA should follow the same procedures in developing molybdenum and uranium criteria. Perhaps the most appropriate forum for evaluating these standards would be reports published in EPA Water Quality Criteria Documents.

Natural Ground Water Variability

Natural ground waters in areas near existing or potential tailings disposal sites commonly show large variabilities in uranium concentrations, even over short periods of time. These variabilities can easily exceed the standards proposed in 40 CFR Part 192.

Table 1 shows monitoring data obtained from 14 wells over a two year period. All wells were completed within the same geologic stratum in the vicinity of a uranium ore body near Casper, Wyoming. If the lowest value obtained during the sampling period had been used to establish baseline conditions for groundwater, all wells except two would have violated the requirements proposed by the EPA. The proposed regulations require that uranium levels not exceed 10pCi/l (approximately 0.015 mg/l) unless baseline conditions are higher. If baseline conditions exceed this value, baseline concentration is the highest allowable concentration. In six wells, the lowest value observed exceeded 0.015 mg/l. Yet other samples obtained from each of these same wells were higher in U_3O_8 concentration and therefore would have violated the regulations due to natural conditions. Of the eight remaining wells which had "baseline conditions" (lowest range value) below 0.015 mg/l, six wells exceed the maximum 0.015 mg/l value suggested as a maximum allowable concentration.

Since natural variances can occur in ground water quality, it seems unreasonable to assume that a small increase in uranium concentration in monitor wells near a disposal site is necessarily due to disposal activities. We therefore feel that if EPA must develop a ground water standard for uranium, they should take into account natural ground water variability.

Summary

Rocky Mountain Energy feels that the uranium and molybdenum standards proposed for ground waters near inactive

uranium processing sites can not be justified. EPA has exceeded its authority to develop regulations since it has not shown that low concentrations of these elements can be toxic to humans. The Agency has in effect established informal drinking water standards without going through the normal review process.

In addition, if the Agency feels an urgent need to establish such standards before scientific data has been presented and evaluated, they should take into account natural ground water variability which will affect sample results.

This concludes Rocky Mountain Energy's comments on the proposed uranium and molybdenum standards for ground waters. We hope they will be of some help to you in revising your proposed regulations. We welcome the opportunity to be of any further assistance.

Sincerely,

Richard E Iwanicki

Richard E. Iwanicki
Licensing Specialist

cc C.M. Bolser
J.A. Yellich
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TABLE 1

ROCKY MOUNTAIN ENERGY
NINE MILE LAKE SITE
REGIONAL MONITOR WELL DATA*

WELL NUMBER	RANGE IN URANIUM CONCENTRATION
BM -1	0.056 - 0.080
BM -2	0.004 - 0.041
BM -3	0.210 - 0.330
BM -4	0.069 - 0.111
BM -5	0.038 - 0.180
BM -8	0.001 - 0.004
BM -9	0.012 - 0.020
BM -10	0.001 - 0.010
BM -11	0.002 - 0.024
BM -12	0.004 - 0.024
BM -13	0.900 - 1.700
BM -14	0.059 - 0.290
Robb	0.001 - 0.069
Block E	0.001 - 0.140

*Data was obtained in 1978, 1979, and 1980 at Nine Mile Lake Project, 9 miles north of Casper, Wyoming. All wells are completed in a single geologic stratum and are located within 4 miles of a possible uranium tailings disposal facility. Concentrations shown are in milligrams per liter (mg/l).

A-79-25-IV-D-87

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Environmental Protection Agency
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West Tower Lobby
401 M Street, Southwest
Washington, D.C. 20460

RE: Docket No. A-79-25 - Proposed Remedial Action Standards for Inactive Uranium Processing Sites Proposed 40 C.F.R., Part 192

Dear Sir:

The following comments are submitted on behalf of the Florida Phosphate Council, Inc. (Council). The Council is a trade association representing seventeen (17) member companies engaged in the mining and beneficiation of phosphate rock and in the production of phosphate fertilizer, elemental phosphorus, and other phosphate-based products.

These comments are directed to proposed 40 C.F.R., Part 192 - Environmental Protection Standards for Uranium Mill Tailings (Proposed Rule). The Proposed Rule appears at 45 Fed. Reg. 27,370-27,375 (April 22, 1980) [Subparts B & C] and at 46 Fed. Reg. 2,561-2,563 (January 9, 1981) [Subpart A].

While some of the Council's member companies may have direct interests in uranium mining operations, these comments are directed toward the indirect effect the Proposed Rule may have upon phosphate mining and reclamation techniques in the State of Florida. Phosphate mining and reclamation processes may result in an enhancement of the low level radiation levels that are naturally associated with phosphate ore. Residual clay materials and sand tailings developed in the phosphate mining and benefication process are used to reclaim land in Florida for many beneficial uses, although the predominant use after reclamation is agricultural.

Thus, there is at least a facial analogy between the processes involving "residual radioactive materials" associated with uranium processing sites and the processes of phosphate mining and reclamation. The Council is concerned that the Proposed Rule may become the basis for future regulatory action directly related to phosphate mining and reclamation.

With regard to specific aspects of the Proposed Rule, the Council asserts that it is overinclusive in that it would set a requirement for remedial action to assure that the average concentration of Radium-226 attributable to residual radioactive material not exceed 5 pCi/g in certain strata of "open land". [Proposed § 192.12(a)]. The Council believes that the only significant problem potentially associated with low level Radium-226 concentrations in soils arises when buildings on the soils are constructed in such a way as to allow a buildup of concentrations of the "daughters" of Radium-226 within the structures. To impose remedial action requirements on all open lands is simply unnecessary.

In addition, the restriction on annual indoor radon decay product concentrations in any occupied or occupiable buildings is unduly restrictive. [Proposed § 192.12(b)]. We note that by letter dated May 30, 1979, then Administrator Douglas Costle recommended to Florida's Governor Bob Graham that the appropriate working level value should be established at 0.02 WL, as opposed to the 0.015 WL contained in the Proposed Rule. [It should be noted that the Council does not necessarily agree that the 1979 0.02 WL proposal was appropriate.]

The Council urges that any attempt to use the Proposed Rule as a basis for future regulation of phosphate mining or reclamation processes would be inappropriate. First, we are unaware of any statutory authority for direct control of reclamation processes involving the low level radiation materials involved in the phosphate industry. In addition, there are significant technical differences between phosphate mining, processing and reclamation techniques and uranium mining, processing and disposal procedures. Finally, various agencies within the State of Florida are already hard at work on developing zoning or building codes that would address the primary perceived area of concern, i.e., the radon daughter level within occupied or occupiable structures.

We appreciate the opportunity to provides these comments on the Proposed Rule. If you have any questions, please contact me or Mr. Homer Hooks, President, Florida Phosphate Council, Inc.

Sincerely,

HOLLAND & KNIGHT

Robert L Rhodes

Robert L. Rhodes, Jr.

RLRJr/dsl

cc: Mr. Homer Hooks
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Environmental Protection Agency
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West Tower Lobby
401 M Street, SW
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RE: Docket No. A-79-25, Proposed Disposal Standards for Inactive Uranium Processing Sites

Gentlemen:

United Nuclear Corporation hereby submits its comments on EPA's Proposed Disposal Standards for Inactive Uranium Processing Sites, 46 Federal Register 2556 (January 9, 1981).

Very truly yours,

G. Stanley Crout
G. Stanley Crout

GSC:CMW/tcg

Enclosure

BEFORE THE
ENVIRONMENTAL PROTECTION AGENCY

Re: Proposed Disposal)
Standards for Inactive)
Uranium Processing Sites,)
46 Fed. Reg. 25566) Dkt.
(Jan 9, 1981))

COMMENTS OF UNITED NUCLEAR CORPORATION

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Attorneys for
United Nuclear Corporation

July 14, 1981

July 14, 1981

TO: Environmental Protection Agency
Central Docket Section
West Tower Lobby
401 M Street, S.W.
Washington, D.C. 20460

RE: Proposed Disposal Standards for Inactive
Uranium Processing Sites, Dkt.
46 Fed. Reg. 2556 (Jan. 9, 1981).

United Nuclear Corporation ("UNC") submits the following comments on EPA's Proposed Disposal Standards for Inactive Uranium Processing Sites ("Proposed Standards"), 46 Federal Register 2556 (January 9, 1981). We support the comments on the Proposed Standards that have been submitted on behalf of Kerr-McGee Corporation, Homestake Mining Company and, generally, the American Mining Congress. Our comments supplement those comments.

UNC's comments address three principal concerns:

(1) The failure of the EPA to take into account the admitted disparity between its model data and assumptions, and data which are available at actual remote sites;

(2) The failure of the EPA to provide that the exception criteria set out in Subpart C Section 192.20 applicable to clean-up standards are also applicable to disposal standards;

(3) The need for more objective criteria to enable the EPA to adjust its general standards to actual conditions at remote tailings sites.

As noted by both Kerr-McGee and Homestake, EPA bases its estimate of risk to the public on the speculative assumption that because high doses of radiation tend to result in adverse

health effects, low doses of radiation will have a proportional effect. As EPA itself admits:

> "No one [presumably this includes EPA] can predict with precision the increase of chance of cancer after exposure to radiation. EPA and other standard agencies base risk estimates on studies of persons exposed at high doses and assume that the low dose effects will be proportionally less. Sometimes this assumption may overestimate or underestimate the actual risk but it is the best that can be done at present." See, Draft Environmental Impact Statement for Remedial Action Standards for Inactive Uranium Processing Sites at p. 4-3.

Additionally, EPA admits:

> "Additional uncertainty comes from our incomplete knowledge of the effects on people of these generally low exposures." Id at 8-3.

As can be seen by the draft EIS itself, EPA admits that the only data it has relied upon are studies of persons exposed to high doses. It simply does not follow that because there is an absence of knowledge about the health effects to persons exposed to low doses that therefore the effects upon persons exposed at high doses is reliable to predict low dose effects. Quite clearly, EPA lacks data on the effect of radiation exposure at low doses. As a result, there is no reliable basis to assess a definite health hazard, if any, from tailings piles. Moreover, there is no justification for this absence of data in light of the fact that it is only low exposure effects that EPA purports to regulate. At a minimum, EPA must first obtain reliable data on low level exposure effects and only then promulgate standards in accordance with the findings of actual field data. Indeed, as more becomes known about the effects of low radon exposure, a consideration must be whether the standards EPA has set on the basis of speculation will prove to have been erroneous, thus resulting in the wasting of hundreds of millions of dollars. Until such data are forthcoming, the EPA standards are based on nothing more than guesswork.

The Draft EIS (supra) makes a similar error in that it focuses principally upon tailings piles near urban areas where, as a result of practices in the past, individuals lived and worked very near the edge of tailings piles where the concentration of radon is higher. Just as it is inappropriate to premise low level health effects for radon on the basis of known health effects of high doses of radon, it is similarly inappropriate to promulgate general standards for remote inactive tailings sites based upon the estimated collective risk to people who have lived and worked at the edge of tailings piles.

As EPA admits, the exposure and resultant risk to people depends on their distance from the tailings pile. EPA also admits "The estimated number of lung cancer deaths associated with a tailings pile is highly variable, depending not only on the size of the pile but also the population density in its immediate vicinity." Ibid, at 4-13. As presently drafted the proposed standards make no allowance for such variation with respect to disposal at remote inactive sites. Yet, EPA clearly recognizes that the concentration of radon decay products changes rapidly with distance from a pile. An accurate assessment of risk depends not on modeling, but upon the actual site of each residence and work place and its ventilation characteristics; the actual length of time that a person is at such a location,

and the actual wind speed and direction. Such data are clearly lacking. Therefore, the proposed regulations, as applied to remote sites, are without basis.

It is apparent that proximity of population to tailings piles is the concern of EPA in its proposed standards. The concerns applicable in such circumstances are altogether absent at actual sites where the nearest resident or structure is often many miles removed from the tailings sites. In a study of four inactive sites which were within populated areas (Grand Junction, Durango, Salt Lake, Monticello) it was concluded that "There is certainly no evidence of significant contribution of radon to any of the cities beyond 0.5 miles from the piles." Further, the atmosphere radon concentration at distances more remote than 0.5 miles "will have been so diluted as to be virtually negligible." See Shearer & Sill. "Evaluation of Atmosphere Radon in the Vicinity of Uranium Mill Tailings" 17 Health Physics 77-88.

In addition, EPA assumes that urban areas, if not already in existence at or near tailings sites will develop in the near future. As stated by EPA:

> "We do not consider the current remoteness of a pile from population centers sufficient by itself to justify relaxing the disposal standards. Even small numbers of people nearby require protection, and the population of an area could increase considerably over the one thousand year period during which the standards apply. Furthermore radon released from tailings piles travels long distances." See Draft EIS at 9-5.

There is no basis whatsoever for these assumptions. As EPA admits:

> "We ignored population changes since 1970. A future increase in population density at several of the urban sites seems likely, but because the actual place of residence would be critical in determining exposure and resulting health impact, we didn't try to incorporate projected population growth." Draft EIS at 4-13. Id.

Thus, EPA itself admits it does not know what to expect in the way of an increase of population at the remote inactive sites. Indeed, EPA's assumption that there will be a future increase of persons who voluntarily choose to live at or near a tailings site is nothing more than an expectation that the population will behave in a lemming-like fashion. Can it rationally be assumed after the experiences of the past that people will be flocking to live at or near tailings sites? With the widely dispersed knowledge of tailings sites, it is irrational in the extreme to assume that tailings sites will become the focus of population centers. More fundamental, it is inconsistent for EPA to state it does not know what the population trends will be, yet state that its disposal standards are required because the expected population trends mandate residences and work places at or near tailings sites. Precisely the opposite is the case. As the uranium ore supply is depleted in the more remote regions of the Southwest, there is no longer an incentive for urban development at or near those sites. In fact, as has been exhaustively analyzed in the San Juan Basin Regional Uranium Study, the historical pattern has been an initial influx of population followed by a rapid population decline upon termination of operations. Consequently, the assumption of increased urban population at or near remote tailings piles is erroneous and unsupportable.

In addition, the EPA assumes that because it is purporting to regulate a "one thousand year period" it must be assumed the government will fail, and therefore, the standards must be set in such a fashion as to provide protection absent government controls. As a threshold matter, it is irrational and without basis in law to assert jurisdiction over a matter based on the assumption that jurisdiction is or will be lacking. The standards set by EPA can only be applicable if the government permanently retains jurisdiction.

Absent jurisdiction there can be no reason to recognize government authority. Therefore, during this so-called "one thousand year period" EPA's standards cannot apply -- indeed, it is assumed there will be no authority to make them applicable. The only logical result is that the EPA is setting standards which it expects are not or will not be applicable. There can be no rational basis to require compliance with standards which, by definition, are expected -- indeed -- predicted, to become inapplicable. Perhaps even more fundamental is that, in effect, EPA has put the Government on notice that it can reasonably be expected that it need not now comply with EPA standards because there will soon be no authority to exact compliance. For, if it is seriously assumed that in a given period the government will fail, there is an equal chance it will fail tomorrow. If it is now known that these standards are not going to be applicable it is folly to comply with them at such great expense. On the other hand, the only manner to assure that the standards are, and will be applicable, is to assume that the standards are, Government will not fail but will continue to protect the public during the next thousand years. In such case, the EPA standards would be too stringent.

In summary, the actual conditions at the remote tailings sites has been altogether overlooked in the promulgation of the inactive standards. Either the general standards themselves must be revised to account for these factual circumstances, or the provisions of Subpart C, Section 192.20 must be expanded to account for such local conditions.

The EPA has recognized the need for such exceptions with respect to clean-up standards:

> "The standards may be unreasonably strict in some exceptional circumstances. If meeting the standards is impossible, or if some clearly undesirable health or environmental side effects are unavoidable, applying the standards would be unjustified." See Draft Environmental Impact Statement for Remedial Action Standards for Inactive Uranium Processing Sites at p.9-4.

However, this allowance for unavoidable circumstances is not applicable to the disposal requirements of the proposed standards.

In addition, the EPA in Subpart C, Section 192.20(c) takes into account the cost of the remedial actions to comply with the cleanup requirements. However, no such allowance is made with respect to costs in implementing the disposal standards. There is no rational basis for such a distinction. The clean-up and disposal standards are purportedly designed to protect the public health and safety. Since the purpose of the two is the same, there is no reason to treat the two differently with respect to applicable exceptions.

Finally, as EPA clearly recognizes, the number of expected deaths when a tailings site is remote from the population is substantially less than when the population is close to a tailings pile. However, the costs to comply with EPA's disposal standards, regardless of remoteness of the tailings site are the same. Clearly, this failure to adjust costs to the benefits to be derived from disposal at remote sites is unwarranted.

CONCLUSION

For the foregoing reasons, the proposed inactive site regulations should be withdrawn and reopened only after appropriate modifications to assure the final regulations are reasonable.

Respectfully submitted,

G. Stanley Crout
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West Tower Lobby
401 M Street, S.W.
Washington, D. C. 20460

Re: Docket No. A-79-25, Proposed Disposal Standards
for Inactive Uranium Processing Sites

Gentlemen:

We submit on behalf of Homestake Mining Company the following comments on EPA's Proposed Disposal Standards for Inactive Uranium Processing Sites ("Proposed Standards"), 46 Federal Register 2556 (January 9, 1981).

Sincerely yours,

G. Stanley Crout

G. Stanley Crout

GSC:sf
Encl.

cc: Langan Swent
William Langston
John Parker
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Sunny Nixon
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July 13, 1981

Environmental Protection Agency
Central Docket Section
West Tower Lobby
401 M Street, S.W.
Washington, D.C. 20460

Re: Docket No. A-79-25, Proposed Disposal Standards
for Inactive Uranium Processing Sites

Gentlemen:

Homestake Mining Company submits the following comments on EPA's Proposed Disposal Standards for Inactive Uranium Processing Sites ("Proposed Standards"), 46 *Federal Register* 2556 (January 9, 1981). We support the comments on the Proposed Standards that have been submitted on behalf of Kerr-McGee Corporation, United Nuclear Corporation and, generally, the American Mining Congress. Our comments supplement those comments.

The Proposed Standards are invalid because radon releases exceeding the limit proposed for inactive uranium mill tailings sites do not pose a significant health hazard, and because the costs to the government of achieving that limit are not justified by the meager health benefits that EPA assumes will be gained thereby. In addition, the tremendous costs of complying with the proposed requirement that tailings be isolated for at least 1000 years solely by physical means cannot be justified, especially in view of the simple institutional controls that would provide adequate protection. Finally, the provisions relating to groundwater are unjustifiably stringent. In sum, the Proposed Standards are unreasonable, arbitrary and unsupported. Accordingly, EPA should withdraw the Proposed Standards and propose new standards that are reasonable in light of the extremely low risk posed by uranium tailings at inactive sites.

I. Proposed Radon Emission Standards

A. **Health Effects** -- EPA has acknowledged that it lacks any epidemiological data showing any health effects of uncovered uranium tailings on nearby residents or the general population.[1] Instead, EPA has based its risk estimate on an assumption, the linear nonthreshold hypothesis, which is inaccurate. *See* Comments of Kerr-McGee Corporation, pp. 8-9.

Professor R. D. Evans, Director Emeritus of the Radioactivity Center and Consultant to Medical Department, Massachusetts Institute of Technology, recently testified that there is no scientific basis for a standard limiting radon release from tailings to 2 pCi/m^2-sec. Testimony of R. D. Evans before the New Mexico Environmental Improvement Board, June 11, 1981 (attached as Appendix A), p. 37. In so testifying, Professor Evans noted that epidemiological studies of populations exposed to much higher than normal background radiation have found no adverse radiobiological effects from such exposure.[2] *Id*. pp. 13-15.

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[1] Studies of the effects of using uranium tailings as fill under dwellings in Grand Junction, Colorado, have found no excess of lung cancer at all and no exess of leukemia associated with houses built on tailings. T. J. Mason *et al*., "Uranium Mill Tailings and Cancer Mortality in Colorado," 49 *Journal of the National Cancer Institute* 661 (1972); M. Cunningham *et al*., "Excess Cancer Incidence in Mesa County, Colorado," NUREG/CR-0635 (Final Report Prepared for the Nuclear Regulatory Commission, 1979).

[2] Among the studies cited by Professor Evans are the following, which are attached as Appendix B: T. L. Cullen, "Dosimetric and cytogenetic studies in Brazilian areas of high natural activity," 19 *Health Physics* 165 (1970); E. P. Franca *et al*., "Status of investigations in the Brazilian areas of high natural radioactivity," 11 *Health Physics* 699 (1965); High Background Radiation Research Group, China, "Health Survey in High Background Radiation Areas in China," 209 Science 877 (1980); A. P. Jacobson, P.A. Plato and N.A. Frigerio, "The Role of Natural Radiations in Human Leukemogenesis," 66 *American Journal of Public Health* 31 (1976); and R. J. Hickey *et al*., "Low-level ionizing (Footnote 2 continued on next page)

B. **Radon Dispersion.** Professor Evans also noted that several sampling studies at tailings sites have been unable to measure any radon from tailings at distances beyond a quarter to a half-mile, and consequently that model-based estimates of health effects on nearby residents are always overestimated.[3] *Id*., pp. 20-24. In addition, Professor Evans testified that "the total radon released from all the inactive, unstabilized uranium tailings piles is a minute fraction of the variations produced by meteorological conditions and agriculture and the total radon released by natural processes from all land areas." *Id*., p. 27. As an example of the relative insignificance of radon from tailings, Professor Evans observed that a natural change of 11 feet in the water level of the Great Salt Lake had cut off several hundred square miles of land and thereby reduced the radon flux in the vicinity of Salt Lake City by eight times as much as the radon flux from the tailings site in that city. *Id*., p. 25.

In view of this evidence, radon emanation from uranium tailings at several times the proposed limit of 2 pCi/m^2-sec. cannot be considered to pose

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(Footnote 2 continued)
radiation and human mortality; multi-regional epidemiological studies," 40 *Health Physics* 625 (1981). The Hickey study concludes that:

> Extrapolation from high exposure levels to low exposure levels is methodologically unsound. Reassessments of any hazards involved with exposure to low-level ionizing radiation should be based on ecologically realistic data acquired at the levels of concern without extrapolation.
>
> Our preliminary results suggest that adopting the nothreshold hypothesis in the absence of strongly supportive observational data at the actual exposure levels and levels of biological orgnization of concern is a dubious procedure. (at p. 638).

[3] The main study cited by Professor Evans is S. D. Shearer, Jr., and C. W. Sill, "Evaluation of Atmospheric Radon in the Vicinity of Uranium Mill Tailings," 17 *Health Physics* 77 (1969), attached as Appendix D to the Comments of Kerr-McGee Corporation (*supra*).

a significant, or even a cognizable, health risk, and the linear nonthreshold hypothesis should not be admitted as a basis for imposing such a limit. EPA should propose a new, substantially higher limit based on epidemiological data supporting a finding that radon release in excess of such limit would pose a substantial health hazard.

C. **Economic Considerations.** Even if the linear nonthreshold assumption is admitted *arguendo*, it produces an estimated risk of only two deaths per year in the United States as a result of radon from tailings at inactive sites. This is a minuscule risk - less than one in 100,000,000 - especially when compared with the risks from the normal activities of everyday life. *See* Comments of Kerr-McGee Corporation, pp. 3-6. A risk of this order cannot justify a regulation that would cost $250 million, by EPA's estimate, or close to $500 million, by the estimate of the Department of Energy ("DOE"). Testimony of Sheldon Meyers, Deputy Asst. Secretary, DOE, before the Subcommittee on Nuclear Regulations, Senate Committee on Environment and Public Works, June 16, 1981.

As an example of EPA's failure to justify the costs that would be imposed by the Proposed Standards, we note the following claims made by the agency in its Draft Environmental Impact Statement for Remedial Action Standards for Inactive Processing Sites ("Draft EIS"):

> [R]educing an uncontrolled radon release rate of 450 pCi/m^2-sec to 10 pCi/m^2-sec would avert about 98% of the potential effects of radon emitted from the uncontrolled pile. (page 6-5).
>
> The proposed standard [of 2 pCi/m^2-sec] typically would reduce radon emissions and their possible effects by 99%. (page 8-7).

> [E]mission rates of [10 to 40 pCi/m^2-sec] can be lowered to 2 pCi/m^2-sec for about 10 percent additional cost. (pages 8-6, 7).

Taking these statements together, EPA is asserting that an additional one percent of the potential effects of radon can be averted at a 10 percent additional cost. Using figures supplied elsewhere in the Draft EIS, the imposition of the Proposed Standard, instead of a standard of 10 to 40 pCi/m^2-sec, will save two lives per century (1% of 200) at a cost of $25 million (10% of $250 million). Using the cost estimates of DOE *(supra)* and industry (see Comments of American Mining Congress), the cost of avoiding a hypothetical risk to two lives per century will be $50 million, even assuming an extreme extension of the linear nonthreshold hypothesis. Clearly, the cost of this additional protection is totally unjustified.

II. Longevity of Disposal Standards.

The requirement of the Proposed Standards that tailings must be controlled by physical disposal methods that will last 1000 years is another example of EPA's disregard of costs, even in the face of the agency's observation that longevity of physical controls is probably the main factor in determining control costs. Draft EIS, p. 6-6. EPA has ignored economic considerations in proposing the very costly 1000-year requirement (see Comments of the American Mining Congress) and providing exceptions only in the case of endangerment of public health or safety or absence of a known remedial action to meet the requirement.

EPA claims that the 1000-year requirement meets the congressional criterion that "the remedial action must be done right the first time." It should be noted, however, that this criterion was not related to the elimination of long-term maintenance under sec. 203 of UMTRCA, but to the choice of technology by DOE in carrying out its remedial action program under sec. 108. *See H.R. Report No. 95-1480(2)* 40, reprinted in *[1978] U.S. Code Cong. & Ad. News* 7467.

The tremendous cost of the 1000-year standard is due in large part to EPA's insistence on physical disposal methods that will not require any maintenance or monitoring during that period. EPA refuses to place any reliance on such "institutional controls" or on land-use restrictions, even though the tailings sites will be owned by the government. As justification for this position, EPA cites its belief that institutional controls cannot be relied upon for longer than one century. This is total speculation and completely arbitrary. It assumes a failure of the government to comply with UMTRAC. EPA is assuming the termination of government in the United States within the next century, which would be a far more catastrophic event than the exposure of the population to an assumed risk of two lives per year. EPA's assumption leads into a morass of arbitrary speculation. If the government is gone, there is no basis for population estimates, for example. EPA has neither reason nor authority to assume the absence of government control in carrying out its responsibility under legislation that specifically establishes such control via ownership of the tailings sites. See UMTRCA, sec. 104.

It appears that EPA has chosen the overly stringent standard of 2 pCi/m^2-sec for radon release in part because of the agency's refusal to rely on land-use restrictions. After admitting that a standard two or three times higher would not affect persons offsite, EPA justifies its selection of the lower standard on the ground that it would enable a "small community" to be constructed on a tailings site. Draft EIS, pp. 8-5, 6. Since the government will own the site, however, the simplest of institutional controls would

prevent such an occurrence. UMTRCA requires such controls, and EPA is not authorized to speculate they will not be employed.

Given the extremely low risk posed by tailings, even as estimated by EPA, and the relative ease and cost savings in the use of institutional controls, EPA's 1000-year requirement, no less than the 2 pCi/m^2-sec standard, cannot be justified. EPA has ignored the directions of Congress to establish acceptable levels and to initiate reasonable efforts. Instead the agency has proposed to require a virtually risk-free environment, at tremendous cost to the government. Clearly, such cost does not reflect a reasonable relationship to the postulated benefits, and the Proposed Standards are therefore invalid.

III. Groundwater Protection Standards.

A. Definition of Aquifer --

(1) The definition of aquifer is too broad. It is defined in a geologic or hydrological sense, rather than in a sense directed to health or use. For example, a geological formation may underlie thousands of square miles, and may be tapped somewhere for drinking water. Unless it is used in the immediate vicinity of the site, it should be ignored completely. If seepage must travel substantial distances to the place of use, dilution, absorption and other natural processes will result in any contamination being innocuous. Thus, the definition of aquifer should be restricted to formations actually used in the immediate vicinity of the site as a substantial human drinking supply. Contaminants in ground water cannot cause harm except where actually used.

(2) The definition of aquifer is too broad in that it includes formations "capable"of yielding usable quantities of ground water to wells or springs. There are many formations which are capable of such a yield, but

are not actually used because of better formations, availability of surface water, or other factors. It is unreasonable for the taxpayers to provide very expensive protective measures for a formation capable of use, but which is not used.

(3) The definition of aquifer is too broad in that it is not tied to a year around permanent water supply for a significant population. The standards used were developed for community water supplies, which consider that people particularly sensitive to a particular contaminant will be included in the population, and will use it for many years. Yet the definition would apply to a ranch line camp with a well that is occasionally used by an adult cowboy not particularly sensitive to a particular element, and most of whose intake is from other sources. It is unreasonable for the taxpayers to provide very expensive protection measures against such eventualities. Many of the sites are in remote Western areas.

(4) The definition of aquifer is unreasonable in that it fails to take into account that it may be far less expensive to provide a few users with an alternate supply rather than protecting a particular source. For example, state laws and regulations in New Mexico provide for exeptions to standards if alternate supply arrangements are made.

(5) The definition of aquifer is unreasonable in that it fails to take into consideration state law restrictions on use. For example, an aquifer may be capable of supplying a water source for a substantial community, but state law restrictions under impairments of prior appropriation may preclude its use entirely, or preclude its use as a source for a substantial population. The standards used were developed for use by substantial communities.

B. Definition of Underground Source of Drinking Water.

(1) The definition of underground source of drinking water is too broad in that it is not limited to an actual supply for a large population. The standards used were adopted with a large, continuous user population in mind. See comment A.3 above.

(2) The definition of underground source of drinking water is totally unreasonable in including aquifers containing up to 10,000 mg/l TDS. It would be extremely rare for water containing 3,000 mg/l TDS to be used by anyone, let alone a substantial, continuous population which was envisioned when the standards used were developed.

(3) The definition of underground source of drinking water is too broad in that it does not tie the aquifer involved to actual use by a substantial population in the immediate vicinity of the site. It is totally immaterial that, for example, the Dakota formation is used in one part of the state, but not near the site.

(4) The definition of underground source of drinking water is too broad in that it is not tied to a continuous water supply for a substantial population. The standards used were developed with such a situation in mind.

(5) The definition of underground source of drinking water is improper for the reasons given in comments above.

C. Definition of Surface Water.

(1) The definition of surface water is defective in that it is far too broad for health purposes. The definition at 40 CFR 122.3(t) includes many intermittent streams whose surface water is not used as a human drinking source at all. EPA contends that even ephemeral arroyos are included within the definition of 40 CFR 122.3(t). It is totally unreasonable to apply

the standards where such surface water is not used for a water supply for a substantial continuous human consumption. Further, dilution, absorption and other factors will completely eliminate any health danger as contaminants pass downstream.

(2) The definition of surface water is defective because the definition at 40 CFR 122.3(t) was developed in connection with a system applying BPT or BAT technological systems. Such a definition is not appropriate under UMTRAC, which is based upon health considerations.

D. Application of Stancards.

(1) The proposed regulations would prohibit any increase in the concentration of a substance for which a standard is provided if the concentration already exceeds the standard for other reasons. If in fact the standard is related to health, then EPA is arbitrary in assuming the water can be used at all if the standard is already exceeded for other reasons. If the standard is really related to health, then such water should not be protected. There can be no justification for protection of water which is already unfit. This would be true if a single standard is already exceeded. There is no reasonable basis for a non-degradation standard for underground water.

(2) Application of the standards at an arbitrary point only 1.0 kilometer or 0.1 kilometer from, respectively, disposal sites or depository sites is unreasonable and arbitrary. Underground water can cause no harm except at a place of actual use. In many instances, a place of use does not exist within the distances provided. The cost of reducing concentrations at a shorter distance than the place of use may cost millions of dollars, with no health benefits gained at all.

(3) The requirement that concentrations be controlled by point of discharge is not proper. In many instances it will be far less expensive and just as health effective to treat underground water at the place of use. If, for example, a single rancher's well is affected at concentrations above the standards, DOE should have the option of providing a simple treatment unit at the rancher's well, rather than an enormously expensive control system at the site of discharge.

(4) The proposed language for concentration in surface waters is impermissibly vague, arbitrary and capricious. One cannot determine what is meant by harmful, in terms of concentration, time or duration of concentration or use, individual sensitivity, human or other use, combination with diet, amount of use, and other factors relating to the subject. Unless the discharge itself in combination with existing concentrations is harmful, there is no reason to adopt a prohibition against increasing concentration.

(5) The proposed language for concentration in surface waters is unreasonable in that it does not make allowance for the character of the receiving water. The regulation should not restrict discharge, for example, to ephemeral streams whose surface water will only exist in response to precipitation events, and which are not used as a regular human drinking water source on a continuous basis. Most intermittent streams in the West are not used as a continuous drinking water source for significant populations. Because the regulation does not take into account the actual use of the surface water, large sums of the national budget would be spent without any health gains.

(6) The regulation for surface water is unreasonable because it includes completely hypothetical future uses, which are totally speculative.

(7) Limiting the concentrations to the proposed standards for any underground source of drinking water is unreasonable because of the definition of underground source of drinking water.

(8) Use of the surface water definitions for NPDES permits is not appropriate for UMTRAC. The NPDES system is not based upon reducing adverse health effects, but requires limits on discharge even if the discharge would not have adverse health effects. Further, the definition for NPDES purposes itself is an unlawful definition, as it exceeds the authority granted EPA for NPDES purposes. This is particularly true in the case of ephemeral arroyos, a common occurrence in the West.

E. The Standards.

(1) The standards used are not appropriate considering the definitions relating to water. The standards were developed with assumptions concerning the variability in a substantial population of users, amount of use, sensitivity of users, duration of use by users, diet intake, and similar factors. However, the proposed standards would be applied where those assumptions do not in fact exist, and where there is nothing but speculation that they ever could exist. The standards were further determined with certain assumptions regarding the ease, and cost of treatment in a distribution system, such as a city water supply treatment facility. These assumptions are not true when applied to a place of discharge, and under conditions where a city water supply will almost never be involved.

(2) The standards used are not appropriate because they propose concentration limits lower than are naturally found in many Western wells, the use of which has been innocuous. For example, data indicates twenty-nine New Mexico communities have at least one well exceeding the arsenic standard, including Albuquerue, Clovis, Arteria, Espanola and Bernalillo.

This data shows six New Mexico communities have at least one well exceeding the barium standard, including Las Cruces. The data showed five New Mexico communities had at least one well exceeding the cadmium standard, and that twenty-six communities in New Mexico had at least one well exceeding the lead standard, including Las Cruces, Lordsburg, Hobbs, Gallup, Portales, Santa Fe, Truth or Consequences, and Ruidoso. Many New Mexico wells exceed the silenium standard. (Data source: New Mexico Public Water Supplies Chemical Data, 1974, New Mexico Environmental Improvement Agency.) This has not resulted in adverse health effects.

Radium.

The proposed standard for radium is unreasonable, arbitrary, capricious, and not related to health protection. Dr. Robley Evans stated that radium 226-228 is the most carefully studied dose to response relationship of any toxin in man. Some midwestern towns have drinking water supplies exceeding 30 pci/l. Elaborate epidemiological studies have revealed no deleterious health effects. In his opinion, a 30 pci/l level in drinking water is innocuous to humans, animals and plants.

Dr. Evans submitted a statement of June 25, 1976, to the New Mexico Water Quality Control Commission when it was considering a radium 226-228 standard. The New Mexico Water Quality Control Commission adopted a standard of 30 pci/l. A copy of Dr. Evan's statement is submitted herewith, along with his article, *Radium In Man*, 27 *Health Physics* 497 (1974) (Attachment C).

Arsenic.

The arsenic standard of 0.05 mg/l is unduly restrictive, and a level of 0.10 mg/l (excluding pentavalent form) will result in complete health protection.

The National Academy of Sciences, in EPA document R3-73-033, March 1973, recommended a level of 0.10 mg/l. Since the pentavalent form is harmless, it should be excluded from the calculation. The National Academy of Sciences found that "[a]rsenic content in drinking water in most United States supplies ranges up to approximately 0.1 mg/l. No adverse side effects have been reported from ingestion of these waters." (p. 59).

A majority of the world's drinking water standards in recent years are above the proposed standard. The average natural daily total intake of arsenic ranges from 100 to 3000 micrograms. If the proposed standard is used, a daily input from water of only 100 micrograms per day would result, using conservative assumptions.

Selenium.

The proposed standard for selenium is too low, and is arbitrary, capricious, unreasonable, and not based upon health considerations. Indeed, the level is so low that it may be adverse to good health. There is no evidence at all showing that selenium is harmful at much higher levels. The New Mexico Water Control Commission, after expert testimony subject to cross-examination, adopted a standard of 0.05 mg/l. Further, New Mexico's medical witness testified a standard of 0.10 mg/l would be safe.

Dr. Gerhard N. Schrauzer, Professor of Chemistry, University of California, San Diego, supported a standard at least as high as 0.10 mg/l. A copy of Dr. Schrauzer's written testimony is enclosed (Appendix D). About 114 wells out of 257 wells serving major communities in New Mexico exceeded the proposed standard. Source: New Mexico Public Water Supplies Chemical Data, 1974, New Mexico Environmental Improvement Agency.

Molybdenum

The proposed standard for molybdenum is not supported by evidence. The Chappell study cited by EPA stated that a drinking water standard for this element is not likely to be required, and the study shows no clinical effects have been noted at much higher levels than that proposed.

Barium.

The proposed standard for barium is not supported by evidence as to health effects. EPA sites fatal toxity at consumptive dose of 550 to 600 milligrams of barium chloride. This level of consumption does not support the proposed standard of 1 mg/l, which even using conservative assumptions, would result in a consumptive dose of 2 milligrams. Almost no food contains barium in an appreciable amount, so additive by diet is not significant. See EPA Water Quality Criteria, 1972, p. 59. Barium sulfate can be swallowed in enormous doses in an insoluable form without harm. Barium does not accumulate in the body, as EPA has acknowledged. Even if one consumed 100 liters of water per day, which is an impossibility, the dose would be less than the minimum amount at which toxicity has been observed. If the standard were increased to 5 mg/l, a very large safety factor would be provided, even on the conservative assumption that 2 liters per day of water were consumed from a single source.

Chromium

The regulations propose a standard of 0.05 mg/l, even though EPA acknowledges lifetime exposure to laboratory animals to less than 5 mg/l in drinking water caused no reported effects. There is a case in which a family on Long Island used groundwater containing 20 times the proposed standard for several years without apparent ill effects. See the testimony of Dr. Victor Zalma, Director of the New Mexico State Health Agency, before the New Mexico Water Quality Control Commission, June 16, 1976, pp. 240-241, a copy of which is attached as Appendix E. Thus a standard of 0.10 mg/l would provide more than adequate health protection for this element which serves essential metabolic functions.

IV. General

The applicability section states the proposed regulations are to apply "following any use of subsurface minerals at such a site." It is submitted this application is not authorized by UMTRAC, and there is not evidence or reason justifying applicability for such a reason.

HOMESTAKE MINING COMPANY

By BIGBEE, STEPHENSON, CARPENTER,
CROUT & OLMSTED

By G. Stanley Crout
G. Stanley Crout

ADDENDA

page 2, footnote 1, Insert after the end of the footnote:

In addition, a study by the Colorado Health Department has found no excess of lung cancer in the region of Durango, Colorado. VII Colorado Disease Bulletin No. 51 (Dec. 22, 1979) page 1.

page 7, line 11, Insert after the word "invalid":

Reliance on simple institutional controls during the period of concern will accomplish the same benefits at far lower costs.

I-9

BEFORE THE
ENVIRONMENTAL PROTECTION AGENCY

Re: Proposed Disposal Standards for Inactive Uranium Processing Sites, 46 Fed. Reg. 2556 (Jan. 9, 1981)	Dkt. A-79-25

SUPPLEMENTAL COMMENTS OF KERR-McGEE
CORPORATION AND KERR-McGEE NUCLEAR CORPORATION

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RECEIVED

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Corporation and Kerr-McGee
Nuclear Corporation

July 15, 1981

SERVICE [illegible]
OFFICIAL [illegible] COPY

Signature Date

I-9

July 15, 1981

To: Environmental Protection Agency
Central Docket Section
West Tower Lobby
401 M Street, S.W.
Washington, D.C. 20460

Re: Proposed Disposal Standards for
Inactive Uranium Processing Sites,
Dkt. A-79-25, 46 Fed. Reg. 2556
(Jan. 9, 1981)

These supplemental comments, filed on behalf of Kerr-McGee Corporation and Kerr-McGee Nuclear Corporation (Kerr-McGee), are directed at the proposed disposal standards for inactive uranium processing sites, 46 Fed. Reg. 2556, (Jan. 9, 1981). Kerr-McGee filed initial comments under cover dated June 18.

1. The New Mexico Uranium Environmental Subcommittee (UES) and Kerr-McGee Nuclear Corporation have recently filed a preliminary statement with the New Mexico Environmental Improvement Board (EIB) outlining their views concerning certain salient features of the Uranium Mill Licensing Requirements promulgated by the Nuclear Regulatory Commission. In particular, the preliminary statement critiques NRC's 2 pCi/m^2-sec radon emanation standard and three meter earth cover requirement. The views set forth in the statement apply with equal force to EPA's proposed 2 pCi/m^2-sec radon standard and 1000-year control provision. The preliminary statement is attached as Exhibit A and is hereby incorporated in these Supplemental Comments.

2. EPA's exclusive reliance on the linear non-threshold hypothesis is inconsistent with pertinent epidemiological studies. Such studies unanimously indicate that low-level radiation such as that to which the public may be exposed from inactive or active mill sites is not harmful and, indeed, may be beneficial. See, e.g., Hickey, et al., Low Level Ionizing Radiation and Human Mortality: Multi-Regional Epidemiological Studies, 40 Health Physics 625 (1981); Frigerio, et al., The Argonne Radiological Impact Program (ARIP)-1. Carcinogenic Hazard from Low-Level, Low-Rate Radiation (Argonne Nat'l Lab. Report ANL/ES-26, Part 1) (1973); High Background Radiation Research Group (China), Health Survey In High Background Radiation Areas In China, 209 Science 877 (1980); Gopal-Ayengar, et al., Evaluation of the Long-Term Effects of High Background Radiation on Selected Population Groups on the Kerala Coast in Peaceful Uses of Atomic Energy, Vol. 11, Proc. 4th Int'l Conf. Peaceful Uses of Atomic Energy, pp. 31-51 (1971).[1/]

Respectfully submitted,

Peter J. Nickles
Charles H. Montange

Covington & Burling
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Washington, D.C. 20006

Attorneys for Kerr-McGee
Corporation and Kerr-McGee
Nuclear Corporation

[1/] Copies of the Frigerio and Gopal-Ayengar studies are attached as Exhibits B and C respectively.

EXHIBIT A

EXHIBIT A

July 2, 1981

Mr. George H. Hensley
Chairman, Environmental Improvement Board
Crown Building
P. O. Box 968
Santa Fe, New Mexico 87503

Re: Regulation of Uranium Mill Tailings

Dear Chairman Hensley:

This letter is a preliminary statement of the views of the New Mexico Uranium Environmental Subcommittee ("UES") and Kerr-McGee Nuclear Corporation ("Kerr-McGee") concerning the proposal pending before the New Mexico Environmental Improvement Board ("EIB") to adopt additional regulations directed against uranium mills and uranium mill tailings in the State.[1] The regulations under consideration emulate the "Uranium Mill Licensing Requirements" promulgated by the NRC at 45 Fed. Reg. 65521 (October 3, 1980). As you know, the NRC has demanded that the EIB adopt these regulations in order to retain regulatory jurisdiction over mill tailings

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[1] In compliance with your letter of June 24 to all the parties to the mill tailings proceeding, the New Mexico UES and Kerr-McGee intend to supply the Board with a more extensive statement on or before August 1.

after November 8 of this year.[2] The New Mexico UES and Kerr-McGee are opposed to the requirements specified in the NRC regulations. Those requirements are totally unsupported. They are not required to protect either the public or the environment. They amount to regulation for regulation's sake. Moreover, they pose a grave threat to the economic feasibility of the uranium industry in New Mexico.

I. The NRC Regulations Are Totally Unsupported

Among the salient features of the NRC regulations are the provisions relating to radon emanation. The NRC regulations specify that radon emanation from tailings piles be restricted to no greater than 2 pCi/m2-sec and that no less than three meters of cover be placed over tailings piles for that purpose.[3] These costly requirements, which are central to the NRC regulations and are being proposed by NRC for adoption by this Board,[4] are totally unsupported.

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[2] NRC has asserted that Agreement State regulations "should be at least equivalent to that of the federal government. . . no later than November 8, 1981." NRC Memorandum and Order dated May 26, 1981, relating to 40 Fed. Reg. 65521. In a brief filed with the United States Court of Appeals for the Tenth Circuit, NRC asserted that "it is unreasonable to interpret [the Mill Tailings Act] as authorizing the states independently to determine the extent to which their implementation s of NRC Requirements would be practicable." Respondents' Opposition to Motion for Stay in Kerr-McGee Nuclear Corporation, et al. v. Nuclear Regulatory Commission, No 80-2043 at p. 27 (May 4, 1981). The New Mexico UES and Kerr-McGee believe that NRC is flatly wrong in its assertion that Agreement States may not diverge from NRC requirements if those requirements are found impracticable within the state. See 42 U.S.C. §20[illegible]2). (Agreement State need conform to Federal stand[illegible]y "to the extent practicable"). More fundamentally, the N[illegible]ements are totally invalid (1) because they were adopted in advance of NRC standards in express contravention of 42 U.S.C. §2021 (2) because NRC has no record support for its requirements, and (3) because the NRC requirements are unnecessary to protect the public health or safety, or the environment.

NRC claims that these stringent restrictions are required to protect the public from alleged hazards from exposure to radon, an inert, radioactive gas. However, there is no discernible adverse human health effect from exposure to radiation from radon emanating from mill tailings piles. NRC frankly acknowledges that fact:

> "We know of no data or studies which indicate definitively that health effects do or do not occur at the low levels of exposure that are anticipated to result from operation of uranium mills."[5]

Even though NRC knows of no data indicating that health effects occur at the low levels associated with uranium milling, it postulates that some effects may occur on the basis of the much criticized "linear non-theshold model." This model assumes that because very high doses of radiation cause health effects, there will be proportional effects at low levels.

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[3] 45 Fed. Reg. 65534 (Criterion Six).

[4] Proposed Appendix A to Part III of the New Mexico Radiation Protection Regulations.

[5] NRC, Generic Environmental Impact Statement on Uranium Milling A-35 (1980).

The linear non-threshold model is, however, an inaccurate predictor of the effects of low-level radiation. Epidemiological studies unanimously indicate that low-level radiation does not cause any adverse health effects and may in fact be beneficial, since people living in high-radiation areas have a lower incidence of chronic diseases such as cancer than people living in low-radiation areas.[6] Indeed, even NRC admits that the "linear non-threshold" theory is of questionable validity.[7]

Even if one accepts the linear non-threshold theory, the risk posed by radon from even totally unregulated tailings piles is insignificant. By NRC's own calculation, it is only about 2.9 in 210,000,000 or about 1 in 70,000,000 for three times the number of mills now in existence.[8]

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[6] See, e.g., Testimony of Professor Robley Evans before the New Mexico EIB at 14-14, citing Hickey, et al., Low Level Ionizing Radiation and Human Mortality: Multi-Regional Epidemiological Studies, 40 Health Physics 625 (1981); Frigerio, et al, The Argonne Radiological Impact Program (AHIP)-1. Carcinogenic Hazard from Low-level, Low-rate Radiation (Argonne Nat'l Lab. Report ANL/ES-26, Part 1) (1973). See also High Background Radiation Research Group (China), HealthSurvey in High Background Radiation on Selected Population Groups on the Kerala Coast in Peaceful Uses of Atomic Energy, vol. 11, Proc. 4th Int. Conf. Peaceful Uses of Atomic Energy pp. 31-51 (1971).

[7] GEIS at U-4 ("presently available epidemiological data no not conclusively rule out the possibility of zero effects at the individual low doses and dose rates involved here..."). See also In the Matter of Duke Power Company (Perkins Nuclear Station, Units 1, 2 and 3), 8 NRC 87, (1975-78 Transfer Binder) Nuclear Reg. Rep. (CCH) ¶30,312 at p. 28669 (July 14, 1978).

[8] See GEIS at 19.

NRC has elsewhere explained that risks of this order of magnitude are "about equal" to the risks posed by "a few puffs on a cigarette, a few sips of wine, driving the family car about 6 blocks, flying about 2 miles, canoeing for 3 seconds, or being a man age 60 for 11 seconds."[9] It is much less than many risks commenly and ordinarily accepted in our society.[10] NRC's low estimate in fact overstates the risk even under the linear non-threshold model. Professor Robley Evans, joined by prominent experts from EPA and the Department of Energy, as well as from Germany, England and Canada, recently published a study indicating that the risk from radon can be no greater than one-third that employed by NRC per unit of exposure and may in fact be zero.[11] Moreover, NRC's risk estimates are based on a model which hypothesizes increased exposure to radon more than one-half mile from a tailings pile. However, no increased levels of radon have ever been detected more than about one-half mile from a tailings pile.[12]

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9. 46 Fed. Reg. 15167 (March 4, 1981).

10. OSHA Testimony of Prof. Richard Wilson, contained in Hutt, Unresolved Issues in the Conflict Between Traditional Freedom and Government-Control of Food.

11. Evans, et al, Estimate of Risk From Environmental Exposure to Radon-222 and Its Decay Products, 390 Nature 98 (March 12, 1981). NRC's regulations take no account of this recent study.

12. Shearer & Sill, Evaluation of Atomspheric Radon in the Vicinity of Uranium Mill Tailings, 17 Health Physics 77 (1969) (concludes that "[t]he results indicate negligible radiation exposure of the surrounding population...").

As professor Evans testified, NRC's erroneous estimate for risk per unit of exposure and NRC's modelling errors alone result in an overstatement by NRC of the maximum risks posed by radon from tailings by at least a factor of ten.[13] Thus, the actual risk from unregulated tailings can be no greater than about 1 in 700,000,000, again for three times the number of mills extant. Even this maximum risk figure is unduly high, because mill tailings are vigorously regulated by New Mexico nad have been for years.

NRC's 2 pCi/m2-sec standard, as explained by Professor Evans, can therefore not be rationalized on the basis of risk to the public.[14] The only rationale remaining to NRC for its stringent requirements is that the agency wants to cover the piles so they will remain covered for "thousands of years."[15] NRC argues that such stringent and unprecendented controls are required because "institutional controls" -- i.e., the government -- may fail and tailings sites may be occupied and used for housing.[16] NRC's rationale is fundamentally inconsistent with the concept of a national government

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13. Testimony of Professor Robley Evans before the New Mexico EIB at 33.

14. Testimony of Professor Robley Evans at 33.

15. 45 Fed. Reg. 54433 (Criterion One).

16. Draft GEIS at 12-10.

and the firmly established principle that the United States is a Union of States established for perpetuity.[17] NRC's rationale is also inconsistent with the provision in the Mill Tailings Act for government control of tailings sites -- a provision which necessarily presumes that our government will endure and that it can prevent people from building on top of tailings piles.[18]

Professor Evans remarks on NRC's proposal aptly summarize the lack of rationale supporting NRC's position.

> "I know of no scientific basis for the proposed two pico curies of radon per square meter per second. Such a standard would involve substantially more expense and more possibility of serious harm to workers and the general public due to hazards of moving large amounts of earth. And with the provisions in [the Mill Tailings Act] for federal custody of disposal sites after completion of remedial action, it would seem that a small buffer zone landscaped but without houses around a stabilized pile, would more than suffice for radiological safety.
>
> "There could be public parks. They could be football fields, playgrounds, baseball, tennis --just don't dig holes in them." [19]

Dr. Evans' testimony stands unrebutted in this proceeding. Consistent with that testimony, as supported by Dr. Schiager

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17. As Chief Justice Marshall explained in Marbury v. Madison 5 U.S. (1 Cranch) 137 (1803), our Constitution is "designed to be permanent." President Lincoln led the Nation through a Civil War to confirm this principle. As Lincoln declared, "the Union of these States is perpetual. Perpetuity is implied, if not expressed, in the fundamental law of all national governments." IV Collected Works of Abraham Lincoln 264 (R.P. Basler, ed. 1953).

18. See 42 U.S.C. §2113(b)(2) & (3).

19. Testimony of Professor Evans at 37.

and other witnesses (including the NRC witnesses themselves), this Board is compelled to conclude that tailings piles do not pose a significant health risk due to radon. Accordingly, cover requirements should be designed with the primary aim of controlling the dust nuisance posed by the piles and to prevent undue erosion.[20] The New Mexico UES and Kerr-McGee believe that this may readily be accompished by proper sloping and about two-feet of appropriate cover. This amount of cover, incidentally, will reduce radon emanation from the piles by a factor of two to ten and reduce gamma radiation essentially to zero. NRC's concern for longevity of controls can be readily addressed through New Mexico's Continual Care Fund and the Mill Tailings Act requirements for government ownership and control. This approach suggested by Professor Evans, the UES, and Kerr-McGee will be far less costly and far more practicable than the proposals of NRC and it in fact will fully protect the public health and safety, and the environment, even from the hypothetical risks vexing NRC.

There are many other unreasonable aspects to the regulations proposed by NRC for adoption here. For example, NRC proposes to require all companies to make arrangements with third parties, such as bonding companies, to assure compliance with the stringent Urnaium Mill Licensing Requirements. NRC

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20. See, e.g. id. at 43.

expressly forbids reliance on self-insurance. This bar on self-insurance is totally unsupported by the record. Third-party arrangements such as bonds are simply unavailable or unavailable at reasonable costs for the type of liability involved here. Moreover, various self-insurance mechanisms will supply assurance of performance of reclamation obligations equivalent to third-party arrangements and at less expense.

II. NRC's Proposed Requirements Are Economically Infeasible and Impracticable

NRC's Uranium Mill Licensing Requirements are totally unreasonable when judged by the costs to comply -- if compliance is possible at any reasonable price. Indeed, the proposed regulations seriously endanger uranium mining and milling in New Mexico and could result in curtailment and closure of additional milling and mining operations.

According to NRC, the cost of complying with their tailings stabilization requirements alone is -- as best we can determine -- between $760 million and $1.5 billion. Since half the uranium in the United States is produced in this State, this means that New Mexico alone will sustain about $400 million to $800 million in costs for one aspect of NRC's requirements alone by the agency's own admission. The New Mexico UES and Kerr-McGee believe that NRC's cost figure is grossly underestimated.

NRC appears to assert that the cost to comply with cover requirements will be only about four or five million

dollars per mill. This is wrong. NRC's "prime option" is below grade disposal. This requirement, applicable to both new and existing mills, doubles the cost according to NRC. Moreover, moving existing piles to comply with the below-grade requirement will be extremely expensive -- ten times or more NRC's estimates. Kerr-McGee roughly estimates that the cost to comply at its Ambrosia Lake facility will run from about $20,000,000 to $100,000,000 or more. Another indication of the excessive cost may be derived from the latest Department of Energy (DOE) estimates for reclamation of inactive sites. DOE estimates that it will cost about a half billion dollars to comply with EPA and NRC requirements at the approximately 1000 acres of inactive sites. This amounts to $500,000 per acre.

It is no secret that many newly licensed mills are not proceeding with construction activities, including mills within this state (e.g., Gulf). Moreover, mills that have been constructed are not in operation (Bokum). Existing mills have cut back or suspended operations (e.g., Sohio and Homestake Mining). The New Mexico uranium industry, which is characterized by older and larger facilities than is the case in other states, is in no position to bear the additional burden of costly new regulations which are without rationale and are totally unnecessary to protect the public health and safety or the environment. In light of the above, it is clear that implementation of the requirements proposed by

Chairman Hensley
July 2, 1981
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NRC will have a very serious economic impact and may result in further reduction in capacity, further stagnation of the domestic uranium industry, and further loss of employment and tax revenues to the State.

The UES and Kerr-McGee intend to file more detailed comments addressing the concerns outlined above as well as many other aspects of the NRC regulations proposed for adoption here. Industry believes that the NRC regulations are unsupported, inconsistent with the evidence, unduly stringent, and wholly impracticable for adoption by the Board for this State. While we acknowledge the desireability and importance of reasonable regulations for our industry, we firmly believe that the regulations proposed by NRC are simply unacceptable, arbitrary, and unnecessary.

Respectfully submitted,

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Vice President of Nuclear Licensing
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A-79-25
IV-D-91

July 15, 1981

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SECTION

The Honorable Anne M. Gorsuch
Administrator
U.S. Environmental Protection Agency
401 M Street, S.W.
Washington, D.C. 20460

Dear Madam Administrator:

Re: Proposed Clean-up and Disposal Standards for Inactive Uranium Processing Sites
(46 Federal Register, January 9, 1981)
Docket No. A-79-25

Enclosed are comments of the American Mining Congress (AMC) on the Environmental Protection Agency's Proposed Clean-up and Disposal Standards for Inactive Uranium Processing Sites.

The American Mining Congress is a trade association founded in 1897. Its membership is composed of over 500 U.S. companies that produce most of the nation's metals, coal and industrial and agricultural minerals; companies that manufacture mining and mineral processing machinery, equipment and supplies; and engineering and contracting companies and banks that serve the mining industry. The membership includes the producers and processors of nearly all uranium in this country.

We hope that these comments will be helpful in preparing final remedial action standards for inactive uranium processing sites. If you have any questions with respect to our comments or if you have need of additional information, please address your requests to me.

Sincerely,

Larry A. Boggs
Larry A. Boggs
Senior Counsel

BEFORE THE

ENVIRONMENTAL PROTECTION AGENCY

Docket No. A-79-25

IN RE PROPOSED CLEANUP AND DISPOSAL STANDARDS FOR INACTIVE URANIUM PROCESSING SITES
(46 Fed. Reg. 2556, January 9, 1981)

Comments Of The

AMERICAN MINING CONGRESS

July 15, 1981

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AMC COMMENTS ON EPA'S PROPOSED CLEANUP AND DISPOSAL STANDARDS FOR INACTIVE URANIUM PROCESSING SITES

On April 22, 1980, the Environmental Protection Agency (EPA) published proposed standards for the cleanup of open lands and buildings contaminated with residual radioactive materials from inactive uranium processing sites (45 Fed. Reg. 27370). These standards were made immediately effective pending public review and promulgation of final standards (45 Fed. Reg. 27366, April 22, 1981). Thereafter, on January 9, 1981, EPA published proposed standards for the disposal of residual radioactive materials from inactive uranium processing sites (46 Fed. Reg. 2556).[1] Simultaneously, the comment period for the cleanup standards was extended to coincide with that for the disposal standards. The public comment period for these standards now concludes on July 15, 1981.

The American Mining Congress (AMC) is an industry trade association whose membership includes producers of most of America's metals, coal, industrial and agricultural minerals; manufacturers of mining and mineral processing machinery equipment and supplies; and financial institutions that serve this industry. AMC's membership includes companies that mine and process a large portion of the Nation's uranium.

AMC and its uranium producing members have a substantial interest in the proposed standards, because of the potential connection between the proposed standards and future standards for active uranium processing sites under Section 206(a) of the Uranium Mill Tailings Radiation Control Act of 1978, Public Law 95-604, 92 Stat. 3039, 42 U.S.C. §2022(b). Accordingly, AMC submits these comments on the proposed cleanup and disposal standards and on the Draft Environmental Impact Statement for Remedial

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[1] Hereafter the two sets of standards will be referred to as "cleanup standards" and "disposal standards", respectively.

Action Standards for Inactive Uranium Processing sites (40 CFR 192) (hereinafter DEIS) issued in support of the proposed standards.

I. GENERAL COMMENTS

A. EPA'S CLEANUP AND DISPOSAL STANDARDS MUST BE PREDICATED ON A FINDING OF SIGNIFICANT RISK TO PUBLIC HEALTH AND SAFETY.

In Industrial Union Department, AFL-CIO v. American Petroleum Institute, 448 U.S. 607 (1980) (hereinafter cited as Benzene), the Supreme Court invalidated an occupational safety and health standard for benzene promulgated by the Occupational Safety and Health Administration (OSHA). OSHA had attempted to lower its benzene standard from ten to one part per million (ppm) of air without any showing that exposure at 10 ppm presented a significant risk of harm. OSHA had based the new standard on a policy assumption — that no safe threshold level of exposure exists for carcinogens in the absence of clear proof establishing such a level. On this basis, the agency set the standard at the lowest level it considered feasible. Relying primarily on Section 3(8) of the Occupational Safety and Health Act (OSH Act),[2] the Supreme Court held that policy assumptions alone are an insufficient substitute for a finding of significant risk:

> [B]efore he can promulgate any permanent health or safety standard, the Secretary is required to make a threshold finding that a place of employment is unsafe — in the sense that significant risks are present and can be eliminated or lessened by a change in practices.

448 U.S. at 642 (emphasis added). Central to the Court's decision was its determination that Congress was concerned "not with absolute safety, but with the elimination of significant harm." Id. at 646.

Similarly, the Atomic Energy Act of 1954 and the Uranium Mill Tailings Radiation Control Act of 1978 were designed to protect the public from significant risks, not to

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[2] Section 3(8) requires that occupational safety and health standards be "reasonably necessary or appropriate to provide safe or healthful employment and places of employment." 29 U.S.C. §652(8).

provide absolute safety. Under the Atomic Energy Act, federal regulatory authority is limited to situations where it is "necessary or desirable . . . to protect health or to minimize danger to life or property." 42 U.S.C. §2201(b) (1976). In the Mill Tailings Act, Congress first found that mill tailings "may" pose a "potential" and "significant" radiation health hazard. 42 U.S.C. §7901 (Supp. III 1979). This finding indicates that the regulatory agencies were required to identify areas of significant risk, if any. If the agencies identified any significant risk, "reasonable" efforts should be made to "prevent or minimize" radon diffusion and other potential environmental hazards. Id. The use of terms such as "significant" hazard, "reasonable" effort, and "prevent or minimize" radon diffusion in the Mill Tailings Act, demonstrates that Congress intended a reasonable, balanced implementation of the statute to reduce significant risks.

To constitute a significant risk and, therefore, justify regulation, an emissions source "must make more than a minimal contribution to total exposure" to a particular pollutant. Ethyl Corporation v. EPA, 541 F.2d 1, 31 n.62 (D.C. Cir.), cert. denied, 426 U.S. 941 (1976) (emphasis added).[3] Indeed, the source to be regulated must contribute "a significant increment to the total human [exposure] burden" of a particular pollutant. Id. at n.63.

In view of the requirements of the Atomic Energy Act and the Mill Tailings Act, EPA must — under the reasoning of Benzene and Ethyl — affirmatively find that uranium mill tailings present significant risks to public health and safety and to the environment, before finalizing inactive uranium site standards. Moreover, under the reasoning of Benzene and Ethyl, EPA must also establish that its proposed standards will result in a meaningful reduction of such risks to public health and safety. EPA has made no such findings with respect to the risks associated with mill tailing at inactive sites. Instead, EPA assumes as a matter of policy that any risk that may be associated with mill tailings is unacceptable. On this policy assumption, EPA's standards "virtually eliminate all the potential hazards" (DEIS at 8-7 and 8-8) and return disposal sites to the agency's concept of "natural" conditions (DEIS at 8-4). However, as Benzene makes clear, policy assumptions are insufficient substitutes for the required finding of significant risk 448 U.S. at 634-652. [4] Until it has made a finding of significant risk, EPA may not proceed to finalize these proposed standards.

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[3] In Ethyl, the Court interpreted language in the Clean Air Act granting EPA authority to regulate gasoline additives that "will endanger the public health or welfare . . . ." 42 U.S.C. §1857(f) (1976). The Court held that "will endanger" meant "presents a significant risk of harm." 541 F.2d at 13.

B. EPA MUST WEIGH THE BENEFITS OF ITS PROPOSED CLEANUP AND DISPOSAL STANDARDS AGAINST THE COST OF COMPLIANCE

1. Executive Order 12291 Requires EPA To Balance The Benefits And Costs Of The Proposed Standards.

Prior to issuing cleanup and disposal standards for inactive uranium processing sites, EPA must conduct a rigorous cost-benefit analysis on its proposal, consistent with the requirements of Executive Order 12291 (46 Fed. Reg. 13193, February 19, 1981).

Under Section 2 of this Executive Order, EPA must in issuing any regulation:

- Proceed only on adequate information concerning the need for and the consequences of proposed government action;
- Act only where the potential benefits to society from the regulation outweigh the potential costs to society; and
- Choose the regulatory "alternative involving the least net cost to society."

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[4] Recently, the Supreme Court reaffirmed its holding in Benzene that OSHA can regulate risks only in cases where it has made a finding of significant risk. American Textile Manufacturers' Institute, Inc. v. Donovan (Cotton Dust), 49 U.S.L.W. 4720 (June 17, 1981). There, the Court found that OSHA had fulfilled the significant risk requirement. The Court noted that OSHA had deleted those assumptions of its carcinogen policy which required the "automatic setting of the lowest feasible level" without regard to a determination of significant risk. 49 U.S.L.W. at 4724 (citation omitted). EPA in this proposal relies on the linear non-threshold theory for its conclusion that some health effects will occur at any exposure level. EPA also assumes that any health effect is significant. After Benzene and Cotton Dust, the linear non-threshold theory and this policy assumption cannot serve as a basis for regulatory action. A supported finding of significant risk is required.

EPA has failed to comply with these requirements in issuing the proposed standards. As developed in AMC's specific comments, EPA's proposed cleanup and disposal standards violate each of these mandates.

Additionally, in the case of a "major rule", [5] EPA must prepare a detailed regulatory impact analysis consistent with the requirements of Section 3 of the Executive Order. In view of the potential costs of compliance with the standards, which the Department of Energy (DOE) estimates to be in excess of $500 million and which AMC estimates to be about $1 billion (See discussion infra at 27-30), the proposed standards constitute a "major rule" as defined in Section 1 of the Executive Order. Therefore, EPA must prepare a regulatory impact analysis with the required rigorous cost-benefit analysis before proceeding to issue final cleanup and disposal standards for inactive uranium processing sites.

2. Preparation Of A Cost-Benefit Analysis On The Proposed Standards Is Otherwise Required By Law

Preparation of a cost benefit analysis on the proposed cleanup and disposal standards is required by the Mill Tailings Act. In that Act, Congress recognized the need for a balancing process in regulatory decision-making. While also recognizing the need for an effective regulatory program to control the disposal of mill tailings, Congress provided for a balanced decision-making process. Section 2 provides "that every reasonable effort be made to provide for the stabilization, disposal, and control in a safe and environmentally sound manner of [mill] tailings . . . ." 42 U.S.C. §7901(a) (Supp. III 1979). By using the term "reasonable effort," Congress intended benefits and costs to be balanced in the development of any regulations.

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[5] Under Section 1(b), of the Executive Order, a "major rule" includes any regulation that is likely to result in (1) an annual effect on the economy of $100 million or more, or (2) a major increase in costs or prices for consumers; individual industries; Federal, State, or local government agencies; or geographic regions. (46 Fed. Reg. 13193, Feb. 19, 1981)

The courts have construed such language as requiring balancing of the benefits against the costs of regulations. For example, the section of the Natonal Traffic and Motor Vehicle Safety Act providing for the adoption of "reasonable, practicable and appropriate" traffic safety standards, has been construed to require the Secretary of Transportation to "identif[y] some of the costs associated with the proposal and [determine] that these costs are overridden by reasonably predictable benefit." H & H Tire Co. v. Department of Transportation, 471 F.2d 350, 356-57 (7th Cir. 1972). (Stevens, J., concurring opinion adopted by the court) (footnotes omitted). 6

Most recently, the Supreme Court has indicated that such language may require a balancing of benefits and cost. American Textile Manufacturers Inst. v. Donovan, No. 79-1479, 49 U.S.L.W. 4720 (June 17, 1981). In Cotton Dust, the Supreme Court held that Section 6(b)(5) of the OSH Act, 29 U.S.C. $655(6)(b)(5) (1976), does not require cost-benefit analysis in setting standards governing toxic materials or harmful physical agents. By comparison, however, the Court stated that other language in Section 3(8) of the OSH Act 29 U.S.C. $652(8) (1976), could require a balancing of benefits and costs for standards not covered by Section 6(b)(5). The Court stated: "the phrase 'reasonably necessary or appropriate' [as used in Section 3(8)] could standing alone be construed to require some balancing of the costs and benefits of a standard." Id. at 4726.

Likewise, a balancing of costs and benefits is consistent with the National Environmental Policy Act (NEPA), 42 U.S.C. 4321 et. seq. NEPA requires that the benefits to be achieved by a proposed regulatory action be balanced against the costs of the action. For example, Section 101 sets forth the policy that federal agencies "use all practicable means and measures . . . in a manner calculated to foster and promote the general welfare . . . and to fulfill the social, economic and other requirements of present and future generations of Americans." 42 U.S.C. $4331(a) (1976) (emphasis added). The need for balancing these factors is emphasized in the Act's requirement that the federal government "assure for all Americans safe, healthful, productive, and esthetically and culturally pleasing surroundings . . . and achieve a balance between population and resource use which will permit high standards of living and a wide sharing of life's amenities." 42 U.S.C. $4331(b) (1976) (emphasis added).

Interpreting these provisions of NEPA, some courts have stated that NEPA requires a "systematic" or "broadly defined" balancing of costs and benefits for major federal actions. Calvert Cliffs' Coordinating Committee v. AEC, 449 F.2d 1009, 1113 (D.C. Cir. 1971); County of Suffolk v. Secretary of Interior, 562 F.2d 1368, 1384 (2d Cir. 1977), cert. denied, 434 U.S. 1064 (1978). While it is clear that NEPA does not always require a fully monetized consideration of costs and benefits, these factors must be balanced. Sierra Club v. Stamm, 507 F.2d 788, 794 (10th Cir. 1974). See also Environmental Defense Fund v. Corp of Engineers, 492 F.2d 1123, 1133-1134 (5th Cir. 1974).

Indeed, where there is no evidence of actual risk to public health and safety from the low levels of radiation associated with mill tailings and where the agency has relied solely on the "linear non-threshold theory," the requirement of reasoned rulemaking under the Administrative Procedure Act mandates a balancing of costs and benefits. EPA has recognized this conclusion in promulgating its radiation protection standards for nuclear fuel cycle operations:

> Since potential effects from radiation exposure are assumed to occur at any level of exposure, it is not possible to specify solely on a health basis an acceptable level of radiation exposure

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[6] Similarly, courts have construed provisions of the Consumer Product Safety Act authorizing the adoption of rules "reasonably necessary to eliminate or reduce an unreasonable risk of injury", 15 U.S.C. $2058(c)(2)(A) (1976), as requiring the agency to assess the expected benefits in light of the burdens to be imposed by the standard. Aqua Slide 'N' Dive Corp. v. CPSC, 569 F.2d 831 (5th Cir. 1978); accord, D. D. Bean & Sons v. CPSC, 574 F.2d 643, 649 (1st Cir. 1978).

> for either individuals or populations; it is necessary to balance the health risks associated with any level of exposure against the costs of achieving that level.
>
> * * * *
>
> The agency has selected the cost-effectiveness approach as that best designed to strike a balance between the need to reduce health risks to the general population and the need for nuclear power. Such a balance is necessary in part because there is no sure way to guarantee absolute protection of public health from the effects of a nonthreshold pollutant, such as radiation, other than by prohibiting outright any emissions. The Agency believes that such a course would not be in the best interests of society.

40 Fed. Reg. 23420, 23421 (May 29, 1975) (emphasis added).

In this same regard, then Administrator Russel Train stated that EPA:

> . . . cannot and should not set [radiation protection] standards without such consideration for two reasons: 1) [because] it is prudent to assume that there is no threshold level for radiation effects in setting standards, that is, risk is proportional to dose all the way down to zero dose. Since there is no safe level of radiation [exposure], there is no logical way to set radiation standards other than to balance risks against costs of control; and 2) the nuclear industry is too important to the nation's future power supply to ignore cost and technology considerations.

Train Memorandum of October 19, 1973, to the President (emphasis added).

In summary, EPA must prepare a rigorous cost-benefit analysis before proceeding with its proposed clean-up and disposal standards.

C. THE DRAFT ENVIRONMENTAL IMPACT STATEMENT SUPPORTING THE PROPOSED CLEANUP AND DISPOSAL STANDARDS FAILS TO COMPLY WITH THE NATIONAL ENVIRONMENTAL POLICY ACT

Section 102(2)(C) of the National Environmental Policy Act (NEPA), 83 Stat. 852, 42 U.S.C. §4332(2)(C) directs federal agencies "to the fullest extent possible" to

> include in every recommendation or report on proposals for legislation and other major Federal actions significantly affecting the quality of the human environment, a detailed statement by the responsible official on —

> (i) the environmental impact of the proposed action,
>
> (ii) any adverse environmental effects which cannot be avoided should the proposal be implemented,
>
> (iii) alternatives to the proposed action,
>
> (iv) the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and
>
> (v) any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented.

EPA's DEIS fails to meet the requirements of Section 102(2)(C).

Compliance with EPA's standards will have unavoidable adverse environmental effects. However, EPA has made little, if any, attempt to consider such effects.

To implement the standards, considerable stripping of land to provide necessary cover material will be unavoidable. In the arid west, where all but one of the inactive sites are located, the stripping of land has significant environmental consequences. No consideration is given in the DEIS to such direct effects of implementing the standards.

Further, remedial action will result in unavoidable health and safety effects. By disturbing any earth, including tailings, radon is released. No consideration is given to the potential exposure risks to the public and workers that would result from disturbing and moving tailings. Such risks should be compared to the potential risks from uncontrolled tailings and tailings that are controlled in place. In addition, earthwork and trucking activities involve substantial actual risks. According to DOE, the remedial action program at Salt Lake City alone will result in 5 fatalities and 62 injuries among the cleanup workers. EPA makes no serious attempt to evaluate such actual risks to workers and the public. EPA dismisses such risks as temporary and negligible (DEIS at 6-10). Since statistics for these actual risks are readily available from other government agencies, such actual risks of implementing the remedial action program should be compared to the hypothetical risks that could be avoided by its implementation.

In the local communities, where the inactive sites are located, implementation could have substantial socioeconomic impacts. No evaluation of "boom-town" effects of implementation have been made. In view of the limited duration of the programs, such impact may significantly affect the local communities. The work forces are likely to be more transitory, less stable, and, therefore, more disruptive for the community. The simplistic assessment in the DEIS of temporary benefits to the community does not justify EPA's failure to consider such impacts. Consideration of potential impacts to the cultural/archaeological resources of the area were also ignored, contrary to the requirements of the National Historic Preservation Act, Executive Order 11593, and the Archaeological and Historical Preservation Act.

For these reasons and those stated in our specific comments, EPA has failed to comply with NEPA.

II. SPECIFIC COMMENTS

A. THE REQUIREMENT THAT THE DISPOSAL STANDARDS BE MET FOR AT LEAST ONE THOUSAND YEARS IS UNREASONABLE

EPA requires "reasonable assurance" that the disposal standards will be met for "at least" one thousand years. EPA asserts that such a period is necessary because of (1) the long period during which potential hazards associated with uranium mill tailings may continue and (2) the congressional directive that remedial action be done right the first time. Although AMC agrees that a definite period should be established as a target for the effectiveness of control techniques, the selected period of one thousand years is unreasonable.

Neither of EPA's reasons requires a period of one thousand years. First, the radiation associated with mill tailings is not different in kind from that occurring naturally in the environment. Further, the amount of radiation is small in comparison with other sources. Indeed, no evidence exists that radon exposure, which is the primary

focus of EPA's proposed standards, at the low levels associated with tailings, produces any detrimental health effects. Second, for remedial action to be done right the first time does not require a 1000 year period. EPA has chosen a period of one thousand years to avoid any active maintenance or other reliance on institutional controls. Such a requirement is on its face, absurd. Reliance on some active maintenance and institutional controls is reasonable and probable in view of the low levels of risk, relative isolation of most inactive sites, and the existing state of technology for disposal.

AMC suggests a 100 or 200 year period. Such a period is consistent with the existing state of the art for tailings disposal techniques. Reasonable assurance can be given that compliance may be achieved for such a period. Although some active maintenance might be required, no unreasonable burden would be imposed on future generations.

B. THE RADON EMANATION RATE CANNOT BE JUSTIFIED

Proposed 40 C.F.R. §192.03(a) limits radon emanations from inactive tailings piles to an average annual rate of 2pCi/m^2/ sec. EPA's apparent justifications for this standard are: (1) that radon flux at inactive sites should be returned to EPA's perception of background levels; (2) that the standard will "virtually eliminate" any risk; and (3) that the cost of meeting this standard will be only 10% more than meeting some less stringent level of control. EPA's justifications are insufficient to support this proposed standard.

1. The Radon Emanation Standard, Must be Predicated On A Finding Of Significant Risk To Public Health Or Safety

As discussed in our general comments, EPA must find a significant risk before establishing a radon emanation standard. Reliance on policy assumptions, e. g.

elimination of all risks by returning radon flux rates to background levels, is an insufficient substitute for a finding of significant risk. [7]

EPA claims that the primary source of potential radiation exposures from mill operations is a gas called radon. Radon is a naturally occurring inert gas that is emitted in variable quantities from a number of sources, including soil, rocks, water, and building materials. In view of Ethyl, the incremental contribution of mill tailings to total radon releases and exposures to the general public must be evaluated carefully.

The amount of radon that is released from uranium tailings piles is insignificant when compared to that released naturally from the soil and other sources. NRC projects that releases at active sites from the accumulation of tailings in the year 2000 will amount to no more than about five one thousandths (.005) of that released from natural soils in the United States. (1 NRC GEIS Table 5 at 19; at 6-68). [8] Moreover, certain activities such as farmers plowing their fields will contribute roughly six times more radon to the environment than mill tailings. (1 NRC GEIS, Table 5 at 19). Other sources, such as water evaporating from soil surfaces and vegetation (evapotranspiration)

will cortribute sixteen times more radon. Id. Significantly, these comparisons are based on NRC's assumptions that no measures will be taken to control radon emanation from tailing piles at active sites and that uranium mill capacity will double in the next 20 years. (1 NRC GEIS at 3). Since tailings at inactive sites account for only about one-sixth of all tailings in existence today (DEIS at 3-1), the incremental contribution of inactive sites to total radon releases will be even smaller than that estimated by NRC for active sites.

The risk to the public from this slight increase in radon release is exceedingly small. EPA estimates that radon from uncontrolled tailings at all inactive sites could result in about two health effects (estimated premature cancer deaths) per year, or less than 1 per 100,000,000 persons in the United States. By comparison, NRC estimates that radon releases from building interiors alone could result in 1,594 deaths per year in the United States and that radon releases from natural soils could cause 1,152 deaths. (NRC GEIS, Table 5 at 19). The two health effects, if they were to occur, [9] would increase annual cancer deaths in the U. S. from 386,700 to 386,702. [10] Thus, the risk from inactive sites is insignificant when compared to the risk from other sources of radon and to the risk of cancer in general.

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[7] The proposed standard is based on the erroneous assumption that there is an "average" or "normal" background radiation level. Due to the extremely wide range of environmental conditions which exist in nature, reliance on a computed average as the basis for the standard is inappropriate. For example, the indoor radon decay product concentration standard is based on average radium in soils and radon in outdoor air. Yet, background radium can be as high as 200 pCi/gm and outdoor radon can fluctuate substantially depending on site and atmospheric conditions. Further, indoor radon concentrations are themselves highly variable.

[8] U. S. Nuclear Regulatory Commission, Final Generic Environmental Impact Statement on Uranium Milling, NUREG - 0706 (September 1980), hereinafter "NRC GEIS." NRC's uranium mill licensing regulations and GEIS are now subject to judicial review - AMC's brief in that action is attached as Exhibit 1.

The NRC GEIS uses a figure of 0.000005 on page 6-68 instead of 0.005. Careful review of NRC's references for the figure demonstrates that the agency's figure is erroneous. This figure represents the estimated persistent, long-term radon releases from the predicted uranium mills in existence or installed during the period from 1979 to 2000. (1 FGEIS at 18, 6-68).

[9] These projected health effects from inactive sites are calculated estimates based upon linear extrapolation from data on uranium miners exposed to far greater concentrations of radon than those to which general populations are ever exposed. (DEIS at 4-3, 4-6). No scientific studies have been performed which measure health effects at low doses to which the general population is exposed. Moreover, linear dose response calculations are "not intended to predict actual health effects but rather to give a basis for setting conservative exposure standards." U. S. Nuclear Regulatory Commission, Office of Nuclear Material Safety and Safeguards, Radon Releases from Uranium Milling and Their Calculated Health Effects, NUREG 0757 (February 1981) at A-1 (hereafter cited as NRC Uranium Fuel Cycle Study). Linear extrapolations generally yield conservative results (2 NRC GEIS, Appdx. A at 34), and "[e]pidemiologic data currently available would not rule out a value of zero for the risk from incremental additional exposure of the very low levels expected for the general public from uranium milling operations . . . ." (2 NRC GEIS, Appdx. A at 32).

[10] Based on statistics for the year 1977. U. S. Department of Commerce, Bureau of the Census, Statistical Abstract of the United States (1979) at 76.

Rational regulatory decisions regarding public health and safety in this field must be made by comparing the potential risks of mill tailings with other risks commonly accepted by society. The process of relating risks from a regulated activity to risks encountered in everyday life is called comparative risk analysis. Comparative risk analysis demonstrates that the risk from uranium milling is much smaller than the risks from many commonly undertaken activities. Based upon the risk estimates in NRC's Draft GEIS (10 health effects per year), [11] AMC determined that the lifetime risk from uncontrolled mill tailings at active sites was equivalent to the risk from the following common activities: [12]

- Smoking 1-1/2 cigarettes in a lifetime
- Driving an extra 1/2 mile per year
- Living in a house without a smoke detector for one month
- Crossing a street one extra time every two years
- Taking one short airplane flight in a lifetime
- An overweight person eating 100 extra calories (such as one piece of bread and butter or one soft drink) in a lifetime

EPA's estimated risk from uncontrolled tailings at inactive sites (two health effects per year or one-fifth of the risk in NRC's Draft GEIS) is less than that associated with smoking one cigarette in a lifetime or driving to the corner drug store once a year. The risk is insignificant when compared to other risks commonly accepted by society.

2. EPA's Radon Standard Is Not Rationally Related To The Potential Reduction In Risk

Even if EPA were to find a significant risk from uncontrolled tailings at inactive sites, this would not authorize EPA to establish indiscriminately any level of radon control. The control level chosen must be rationally related to the potential incremental benefits, or risk reduction, achieved.

EPA's radon standard is not rationally related to possible risk reduction benefits. EPA's own data show that 78% of its estimated 200 health effects per century could be averted by reducing radon emissions from 450 [13] to 100 pCi/m^2/sec. (DEIS, Table 6-2 at 6-7). In other words, if radon emissions were reduced to 100 pCi/m^2/sec, estimated health effects would be reduced to 44 per century, or less than one every two years. The data show that 90% of this already small estimated risk (e.g. 180 out of 200 health effects per century) would be eliminated by lowering emissions to 40 pCi/m^2/sec and that 98% of risk would be averted by lowering emissions to 10 pCi/m^2/sec. Id. However, EPA rejected all alternative control levels because they would not achieve its policy objectives of eliminating all the potential hazards (DEIS at 8-7, 8-8) and returning disposal sites to its perceptions of natural conditions (DEIS at 8-4).

EPA's arbitrary rejection of reasonable alternatives underscores the importance of evaluating the relative significance of the risk at various levels of control. To evaluate properly the need for a particular level of regulation, EPA must compare the risk reduction potential at each incremental control level. In this way, EPA can determine the point at which the incremental risk reduction potentially achieved by additional control measures begins to diminish significantly. In this case, EPA has unreasonably rejected alternative control levels and has failed to consider the diminishing returns of increasing levels of control. Before issuing final regulations, EPA must consider possible risk reduction benefits at other levels.

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[11] U. S. Nuclear Regulatory Commission, Draft Generic Environmental Impact Statement on Uranium Milling, NUREG-0511 (April 1979) at 6-72 (hereafter cited as NRC Draft GEIS).

[12] AMC comments on NRC Draft GEIS, captioned "Vol. 1, Part III" at 82-83. AMC's comments, which are in three volumes, are attached as Exhibit 2.

[13] It should be noted that EPA's assumed radon release rate is considerably higher than the 280 pCi/m^2/sec assumed for NRC's model mill. (1 NRC GEIS at 9-24).

EPA has also ignored reasonable alternatives to a radon emanation standard. AMC suggests that a radon concentration or radon exposure standard should be considered. EPA estimated that the total effect from all 22 disposal sites would be about 200 health effects per century or two per year. (DEIS at 8-3). [14] The data show that more than 75 of these estimated health effects are attributable to the Salt Lake City site [15] and that about 25 are associated with the Grand Junction site. (DEIS at 4-14, 4-15). The remaining 100 health effects (or an average of less than 0.05 per site per year) are distributed among the remaining 20 sites.

Moreover, EPA conceded that the number of estimated health effects from a disposal site depends strongly on the size and location of the local population. (DEIS at 8-2). Based upon certain theoretical data, EPA determined that radon concentrations are generally the same as normal concentrations in residential structures at distances of one to three miles from disposal sites. (DEIS at 4-17). Indeed, one independent study, based upon actual measurements at four tailings sites, showed that radon from tailings is indistinguishable from background levels at approximately 1/4 to 1/2 mile from tailings piles. [16] As a result, evaluation of risk is a highly site-specific determination. (DEIS at 4-17, 8-2). For most persons, however, exposure to radon from tailings piles will be indistinquishable from background exposures.

For these reasons, a concentration or exposure standard would permit differing remedial treatment for the sites that better reflects the actual public risks.

Even if a radon emanation rate must be employed, EPA should develop a standard that takes into account potential population exposures. Such a standard could include a range of control levels which could be implemented on a site-specific basis according to projected population exposures. In light of the small risk involved even for persons living relatively close to a disposal site, [17] AMC believes that a range of 40 - 100 pCi/m^2/sec would be more than adequate to protect the public.

3. EPA Substantially Overestimated The Risk From Radon Exposure

EPA's own data demonstrates the insignificance of the risk posed by inactive tailings sites. However, careful analysis of this data reveals that EPA's risk assessment substantially overestimates the risk. For example, EPA's health effects estimates can

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[14] It is not clear whether this figure includes the Canonsburg site.

[15] Even the risk from this site, which is located in downtown Salt Lake City, is relatively small. EPA estimated that radon releases from this site would result in an average loss of life of about 1.1 day per exposed person. (DEIS, Table 4-1 at 4-14). Other risks to which society is commonly exposed result in the following average estimated loss of life:

Health Risk	Average Days of Life Expectancy Lost
Smoking 20 cigarettes/day	2370
Overweight (by 20%)	985
All accidents combined	435
Auto accidents	200
Alcohol consumption (U.S. Average)	130
Home accidents	95
Drowning	41
Safest jobs	30
All catastrophes (earthquake, etc.)	3.5
Salt Lake City tailings	1.1

AMC comments on NRC Draft GEIS, Vol. 1 Part III at 84-85; NRC, Draft Occupational Guide, Instruction Concerning Risks From Occupational Radiation Exposure (May 1980) at 13.

[16] S. Shearer, Jr. & C. Sill, Evaluation of Atmospheric Radon in the Vicinity of Uranium Mill Tailings, 17 Health Physics 77-88 (1969). NRC has stated that radon from tailings is indistinquishable from background levels at distances "of a few miles." NRC Uranium Fuel Cycle Study at A-7.

[17] NRC estimated that radon exposures to persons living within 50 miles of a typical mill, using "worst case" assumptions, would amount to no more that about 0.005 of background radiation exposure. (1 NRC GEIS at 6-68).

be traced to unpublished data by Archer, which have been rejected by established experts in the field.[18] EPA's reliance upon the discredited Archer data, resulted in an overestimation of the risk by a factor of 3 to 10. (Evans Letter at 13-15). The most recent, scientifically - accepted estimate of risk is 10^{-4} health effects per WLM for members of the general population. (Id. at 15).[19] Significantly, 10^{-4} per WLM is considered the upper limit of lifetime risk (Id.), i.e. the risk is probably even lower. This upper limit estimate of risk was based upon meticulous review of all United States and Czechoslovakian uranium mining epidemiological data by recognized experts in the field. Incorporation of this reliable scientific evidence into EPA's risk assessment would lower its already small risk by a factor of 3 to 10. (Id.).[20]

4. The Costs Of Achieving The Proposed Radon Standard Far Exceed The Possible Benefits

Estimated costs outweigh substantially possible benefits at the radon control level proposed by EPA. EPA estimates that reducing radon emissions to 2 pCi/m^2/sec could avert 99.6% of the potential health effects, or reduce them from an estimated 200 to 0.8 per century. (DEIS, Table 6-2 at 6-7). Achieving this level of control would cost

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[18] Letter dated May 27, 1981 from Robley D. Evans to Dr. William A. Mills, Director, Criteria and Standards Division, Office of Radiation Programs, U. S. Environmental Protection Agency at 12-16, hereinafter cited as the Evans Letter.

[19] Evans, R. D. et al., "Estimate of Risk from Environmental Exposure to Radon-222 and its Decay Products," 200 Nature at 98-100 (March 12, 1981).

[20] Another major error is found in Table 4-2 (DEIS at 4-18), which lists theoretical radon decay product exposures at distances downwind from a hypothetical inactive pile. The dispersion model used by EPA grossly overestimated radon concentrations, as determined by actual measurements. Additionally, EPA's incorrect assumption of 50% decay product equilibrium compounded the error. (Evans Letter at 6-8). For example, exposures at distances within 0.5 mile of the tailings pile are overestimated by a factor of about 10. (Id. at 8).

about $400 million according to industry estimates.[21] Thus, the estimated cost would be $2 million per health effect averted per century.

The cost-benefit balance becomes even more absurd when the more reliable risk estimates developed by Evans, et al., are substituted for EPA's data. Assuming that EPA overestimated the risk by a factor of 6.5,[22] reducing radon emissions to 2pCi/m^2/sec would avert about 31 potential health effects per century. Thus, the estimated cost, when more realistic risk estimates are used, is about $13 million per health effect averted per century.

To impose such excessive costs to reduce such miniscule risks is highly unreasonable. As stated in a concurring opinion in Benzene:

> When the administrative record reveals only scant or minimal risks of material health impairment, responsible administration calls for avoidance of extravagant, comprehensive regulation. Perfect safety is a chimera; regulation must not strangle human activity in the search for the impossible.

488 U. S. at 664 (Burger, C. J. concurring).

AMC believes that a complete re-evaluation of the costs and benefits of EPA's radon standard is necessary. EPA must develop standards which are reasonable and which may be accomplished at the lowest possible cost.[23]

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[21] See discussion of costs at 27-30 infra.

[22] Evans estimated that EPA overstated the risk by a factor of 3 to 10 as a result of its reliance upon the discredited Archer data. (See discussion 17-18 supra).

[23] EPA rejected a control level of 40 pCi/m^2/sec — a level at which 90% or 180 of the 200 estimated health effects per century would be averted. According to EPA, reduction from 40 to 2 pCi/m^2/sec would cost only an additional 10%, assuming certain favorable conditions. (DEIS at 8-6, 8-7). However, 10% of 400 million is a large expenditure to achieve such miniscule benefit. Moreover, NRC's data indicate that the incremental cost would be considerably higher. (See 1 NRC GEIS, Table 12.5 at 12-22).

C. THE PROPOSED WATER STANDARDS ARE UNREASONABLE

AMC has a number of concerns with the ground and surface water standards of proposed 40 CFR §192.03(b) and (c). EPA has failed to demonstrate any significant public health hazard from uranium mill tailings or to establish that the proposed water standards would alleviate any such hazard in a cost-effective manner. In addition, EPA has unreasonably failed to consider the existing or anticipated uses of surface and ground water. Rather, EPA proposes to treat virtually every underground water bearing formation as if it were a drinking water source.

The proposed regulations provide that seepage from tailings ponds shall not cause concentrations of selected elements in groundwater to exceed the maximum contaminant levels under the National Interim Primary Drinking Water Standards. To the extent that background concentrations already exceed maximum concentration levels (MCL), any further increase in these concentrations is prohibited. This prescription, in many cases, makes little sense. Because of the shallow depths of many uranium ore deposits, the original quality of water at tailings sites may be suitable for no higher use than industrial or agricultural purposes. If the initial water quality of an aquifer underlying a uranium mill tailings pond renders it suitable only for industrial use, no purpose is served by prohibiting a slight increase, or indeed a large increase, in the concentration of one of the listed substances in Table A. [24]

Further, EPA has provided no rationale for applying standards developed under the Safe Drinking Water Act. The MCL's promulgated under that Act were developed to assure the public a potable water supply free from significant health hazards.

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[24] Moreover, these standards may be frequently exceeded by normal background conditions in uranium producing areas.

In view of the remote locations of most mill tailings disposal sites, it is arbitrary to adopt such stringent standards absent a compelling rationale.

The proposal further lacks any plausible rationale for the requirement that specified standards be met at either 1 km or 0.1 km, depending on the nature of the disposal site. EPA's primary concern should be health effects resulting from utilization of groundwater, which has hazardous concentrations of a particular chemical as a result of the disposal facility. To the extent that the owner of a tailings disposal facility owns or controls the use of groundwater, that controlled geographic area should be the boundary for application of the standards.

Certain criteria listed in Table A are unduly restrictive. The suggested limit of 10 pCi/ liter (l) for uranium has no sound scientific basis. Guidelines for uranium in water have been promulgated by federal, state, and international agencies. NRC limits uranium concentrations in effluents released to unrestricted areas to 30,000 pCi/l. NRC's limit assumes a dilution factor of 10 before the water is consumed by an individual. Thus, the effective limit for human consumption is 3,000 pCi/l. The Wyoming Department of Environmental Quality has adopted a uranium in water standard of 5 mg/l. This translates roughly into an activity concentration of 3400 pCi/l. International Commission on Radiological Protection (ICRP) Publication 30, "Limits for Intakes of Radionuclides by Workers" (1979), also differs substantially from EPA's uranium standard. The most restrictive Annual Limit on Intake (ALI) in ICRP Publication 30 is for the uranium-234 isotope, which is 1.08×10^{-5} curies. This is equivalent to a water concentration of 14,800 pCi/l for water consumed by radiation workers. Normally, the value applicable to the general public is determined by dividing by a factor of 30. This corresponds to a uranium in water concentration of 490 pCi/l.

The radium-226 water concentration acceptable for general population use based on the ICRP Publication-30 is equivalent to 86 pCi/l. This indicates that the 5 pCi/l limit for radium-226 (plus radium-228) is also too restrictive. Finally, no health justification exists for the proposed limit on molybdenum concentrations.

EPA's water standards must be based upon a finding of significant risk. Therefore, EPA must explain the public health and safety necessity for standards substantially lower than those established by these other agencies.

D. THE PROPOSED RADIUM IN SOILS STANDARD IS UNREASONABLE

1. The Proposed Standard Is Based On An Erroneous Assumption

In support of the 5 pCi/gm radium in soils standard of proposed 40 CFR §192.12(a), EPA relies upon the assumption that radium-226 soil concentrations of 5 pCi/gm or more will result in radon decay product levels in structures in excess of 0.01 WL (DEIS, p. 7-3).

No rational basis exists for the conclusion that 5 pCi/gm radium-226 will result in indoor radon decay product levels of 0.01 WL or more. Radon flux rates for a given radium-226 soil concentration are very sensitive to a variety of conditions including grain size distribution, moisture content, soil compaction, and barometric pressure. Indoor radon decay product levels are also dependent on the type of building materials and configurations for the structures. Thus, no consistent correlation between radium-226 in soils and indoor radon levels has been established. EPA has acknowledged this fact (DEIS, at 7-3), yet it proposes a standard for radium in soils based on an assumed correlation.

The proposed standard limits radium-226 in soils to a 5 pCi/gm in any 15cm below one foot. The correlation between indoor radon decay product concentrations and radium in various soil layers below one foot is even more tenuous. The physical and chemical characteristics of the soils greatly affect the depth from which radon can escape to the atmosphere. According to NCRP Report No. 45, "A soil layer about 0.25m thick furnishes the external radiation from the ground". However, EPA established no depth limitation in its proposed standard. If the radium-226 standard is to have any correlation to indoor radon decay product concentrations, an assessment of the depth/exhalation phenomenon is needed.

EPA relies on two publications for its conclusion that a 5 pCi/gm radium level will cause a 0.01 WL indoor radon concentration. One is the Healy and Rogers report which makes a preliminary study of radium-contaminated soils. The report contends that indoor radon decay product concentrations of 0.01 WL might be expected for soils with radium concentrations of 1 to 3 pCi/gm. This is not a reasonably scientific foundation for standard setting. The other publication is the NRC Staff Technical Position on Interim Land Cleanup Criteria for Decommissioning Uranium Mill Sites, Appendix J, NRC Draft GEIS, which includes a table entitled "Potential Exposures from Radon Inside Structures on Contaminated Land." EPA uses this table to conclude that 3 to 5 pCi/gm of radium can cause indoor concentrations of 0.01 WL. However, the table indicates radon levels inside structures on land averaging 5 pCi/gm of radium-226 could range from 0.0024 to 0.04 WL. This wide range of values demonstrates the questionable validity of using a radium-226 standard to determine WL concentrations in indoor structures. NRC concludes that "since no simple numerical criteria in terms of radium - 226 concentration in soil is applicable, no attempt has been made to express these criteria directly in terms of radium - 226 soil concentrations". NRC Draft GEIS, Appdx. J at 5-3, 5-4.

A comprehensive analytical study of radon flux rates that can be anticipated under conditions typical of uranium mining conditions in the western United States has recently been completed by AMC. A summary of the results of this work is attached for consideration by EPA (Attachment A). Although this work is expressed in terms of uranium mine waste, the concepts of the relation between radium in soils and indoor radon decay product concentrations are applicable to mill tailings cleanup efforts. The study shows that structures with average ventilation, which are situated on reclaimed waste rock deposits having radium-226 concentrations averaging 20 pCi/gm to infinite depth will normally exhibit radon decay product concentrations on the order of 0.01 WL. Corresponding calculations for radium-226 concentrations averaging 30 pCi/gm to infinite depth result in indoor radon decay product levels on the order of 0.02 WL. Similar structures situated on deposits having radium-226 concentrations averaging 20 pCi/gm near the surface and up to 70 pCi/gm below the surface to infinite depth are shown to exhibit decay product concentrations no greater than 0.02 WL. From this study, it can be seen that using a 5 pCi/gm radium in soil standard to control indoor radon decay product concentrations is far too low. If a radium in soil standard is to be used, a standard of no less than 30 pCi/gm should be used.

A number of other publications addressing related issues exist, but EPA makes no attempt to distinguish the conclusions of those publications. In Borrowman and Brooks, a radium-226 level of 20 pCi/gm was found to be acceptable for building materials. O'Riordan determined that the use of construction material having an average radium-226 content of 25 pCi/gm would result in an annual exposure of 0.4 WLM, which is about 1/10 of the annual limit for exposure to the general public recommended by the ICRP.

2. The Proposed Radium Standard Is Not Capable Of Practical Implementation

Nature exhibits an extremely wide range of environmental conditions. This is particularly true for natural radioactive materials and radiation exposure rates. Background levels of radium-226 in soils can be as high as 200 pCi/gm. Therefore, it may be difficult to distinguish radium-226 associated with tailings from variations in natural background radium-226 concentration.

One practical problem associated with implementing the standard is the lack of accurate methods for location and detection of radium-226 in soil layers. Current field instrumentation cannot detect radium-226 concentratons in the specified layers of soil. Additionally, "clean" surface layers can shield deeper layers which may be contaminated in excess of 5 pCi/gm. To locate and detect soil layers which exceed the proposed standard would require an extensive program of sample collection, including core sampling, and laboratory analysis. Such a program would be very costly and time consuming and would provide no assurance that all contaminated areas would be identified.

Another problem is attributing various radium-226 concentrations to tailings contamination. Natural background radium concentrations in the western States, where most of the sites are located, are highly variable. Because there have been no background surveys, it will be difficult to determine whether radium-226 levels in excess of 5 pCi/gm are due to tailings contamination or to the presence of natural pockets of high background levels. For example, only after a lengthy and costly program did the NRC conclude that the main problem in Edgemont, South Dakota homes was natural radiation, not tailings contamination.

The required compliance verification/certification program will also be difficult and costly to implement. Another extensive and costly measurement program will be needed to determine compliance. Verification that every area greater than 5 pCi/gm, attributable to tailings, has been detected and remedied to standards will be impossible.

Not only are the practical limitations of the field instrumentation and verification process not considered, the problems inherent in existing analysis techniques for radium-226 are ignored. Present techniques are slow and time-consuming and lack the precision necessary to measure low concentrations accurately. A report comparing analyses of aliqnots of 10 samples at a number of different commercial, government, and industrial laboratories can be found in Attachment B. This report shows that existing laboratory techniques are too imprecise to verify compliance with a standard as low as 5 pCi/gm. Standard deviations between the laboratories were computed for each of the 10 samples and range from 1.5 to 4.3 pCi/gm. Regression analysis of the relationship between the mean values and related standard deviations shows a correlation coefficient of 0.75. This analytical variability at low radium-226 concentrations can be substantial.

In promulgating final standards, EPA should consider the advisability of adopting a radium in soils standard in view of the practical problems of implementing such a standard.

E. THE PROPOSED INDOOR RADON CONCENTRATION STANDARD CANNOT BE RATIONALLY JUSTIFIED

AMC believes that the indoor radon concentraton standard of proposed 40 CFR §192.12(b) should be reconsidered.

First, EPA has failed to find that indoor radon concentrations from mill tailings present a significant risk to public health or that implementation of the proposed standard would measurably reduce any risk. Although more than 20 years has elapsed since uranium mine tailings were widely used as a source of building materials in Grand Junction, Colorado, no increase in the incidence of lung cancer in that community has been found. Indeed, the incidence of lung cancer in that county, Mesa, is no greater than the incidence in five surrounding counties.

Second, since promulgation of the proposed standard, a new study has been published that indicates that the upper limit of the risk factor is 10^{-4} per WLM exposure. Evans, et al., "Estimate of Risk from Environmental Exposure to Radon-222 and its Decay Products", 290 Nature 98 (March 12, 1981). This upper bound value is based on meticulous review of all domestic and Czechoslovakian uranium mining epidemiologic data. Based on the risk assumption of this study, there is no proper scientific basis for selecting the unnecessarily restrictive value of 0.015 WLM for the indoor radon exposure limit, including background values.

Finally, the proposed standard varies from other standards established to protect public health without any scientific justification. The remedial action level set for persons residing on the Florida phosphate lands is 0.02 WL (DEIS p. 7-8). The Surgeon General's 1970 remedial action guidance for Grand Junction, Colorado, consists of two levels which recognize that different types of buildings are occupied for different time

periods. These levels are 0.01 WL for residences and schools and 0.03 WL for other buildings. These levels are above background. Additionally, NRC recommends a level for non-occupational exposure of 0.03 WL (10 CFR Part 20, Appendix B, Table 2).

EPA's 0.015 WL standard includes background. Although EPA assumes a "normal" background of 0.005 WL, it recognizes wide variations in "normal" indoor background levels exist (DEIS at 7-9). The data given in the DEIS itself, in Table 7-1, indicate that 10 to 20 percent of structures unaffected by tailings may have background levels above the 0.015 WL standard. Samples taken in Chicago, Illinois had a "normal" level (i.e. an average) of 0.03 WL. See Cohen, "Health Effects of Radon from Insulation of Buildings," 39 Health Physics 937 (December 1980). Moreover, Table 7-2 of the DEIS shows that 60 of 217 residences and schools in Grand Junction that have been treated have not yet been brought below the action level (0.017 WL). In short, the background levels in structures vary so widely that a 0.015 WL standard is too low.

F. THE COSTS OF COMPLIANCE WITH THE PROPOSED STANDARDS ARE INADEQUATELY CONSIDERED

The cost data presented by EPA is inadequate. First, no data is presented on the cleanup standards. Without such cost data, the conclusion that "it should cost little more to implement the proposed cleanup standard than to permit levels two to four times higher" can not be justified (DEIS at 8-24). Additionally, without adequate cost data, it cannot be determined whether the cost is reasonably related to possible benefits. Second, the cost evaluation presented for the disposal standards is insufficient.

Chapter 6 and Appendix B of the DEIS address the monetary costs for tailings disposal. Based on the experience of its members in earth moving and tailings reclamation, AMC believes that the cost of remedial action to implement the proposed remedial action standards will be considerably higher than EPA projects.

AMC notes omissions of certain costs and inadequate consideration of other factors. No consideration is given to costs for engineering, field supervision, or contingencies. No provision is made for costs of reclaiming the land from which top soil, cover, or riprap is obtained.

Riprap is not readily available; it may have to be quarried. EPA, however, makes no provision for such costs. Experience on tailings pile stabilization shows that riprap costs approximately $18.00 (versus EPA's figure of $12.90) per square meter, 0.5m thick. This includes quarrying, crushing, hauling and placing. Moreover, EPA assumes a nearby source of suitable clay is available at no cost (DEIS at B-10). In some locations, a suitable clay is either nonexistent or very scare; or if available, only at a considerable distance.

In addition, EPA relies on inappropriate source material. The sources used for computing the costs for various types of work, e.g. Dodge (DO 78) and Means (ME 77), represent costs for the small commercial and residential market and do not compare favorably with costs incurred with heavy earthworks or industrial construction.

AMC has made a comparison of EPA's unit costs (DEIS, Table B-1, at B-7) with costs being experienced in actual tailings dam reclamation work. This comparison is shown in Table 1, infra at 31. The industry experience in some instances compares favorably with the costs in the DEIS, e.g., clay caps, asphalt, gravel, and fence. However, for below-grade excavation, transportation, synthetic liners, and soil and vegetation cover, the industry figures are 2.5 to 3 times higher.

The ranges for excavation costs shown in the first paragraph on page B-9 are reasonable, but the lower range of these costs was used in the Table B-1 unit costs. EPA estimates costs of $0.92 to $1.58/m^3 for excavating, loading, and hauling surface soil up to one mile (DEIS at B-9). AMC estimates approximately $2.80 per cubic meter will be incurred for haulage costs alone. Costs for hauling, dumping and compacting are in the range of $5.00/m^3.

To evaluate the effect of EPA's methods, as well as the unit costs, estimates for two cases comparing EPA and industry figures were made. Case I, shown in Table 2, infra at 32, includes stabilizing the tailings in place to a radon emanation rate of 2pCi/m^2/ sec using a clay and dirt cover and vegetation for stabilization (DEIS, Table B-10, Column 2). [25] Case II, shown in Table 3, infra at 33, includes stabilizing in place to the same radon emanation rate but with riprap instead of vegetation for stabilization. [26]

Industry costs were from 2.2 to 2.7 times higher than EPA's in Case I, and were from 1.8 to 1.9 times higher in Case II. In similar comparisons for moving the tailings to a new disposal area (option 3 in the DEIS), the industry figures were from 2.7 to 2.9 higher than the EPA estimates.

The above data do not include costs for reclamation of the borrow sites. No costs are included for cleanup around the mill sites, for remedial action at offsite locations where tailings were used for fill material, survey and decontamination of used equipment, burial of contaminated equipment, demolition and disposal of buildings, or reclamation of the mill site. When costs for these items are added to the tailings disposal costs, and AMC's estimates, which are two to three times EPA's, are used, the total remedial costs for the 24 inactive mill sites, which EPA estimates at $200-300 million (DEIS at 5-3), will be about $1 billion.

---

[25] Case I assumptions are: Reclaim in place. Clay cap 0.6m thick over tailing sands only - (excluding embankment slopes); earthworks include changing 2:1 embankment slope (no tailing sand included) to an 8:1 slope by extension only with available earth materials, and 1.5m of dirt cover; vegetation topsoil 0.2m over total tailings and embankment area; engineering and construction supervision 15% of total direct cost; and contingencies, 15% of total direct cost.

[26] Case II assumptions are: Reclaim in place; clay cap 0.6m thick over tailing sands only (excluding embankment slopes); earthworks include changing 2:1 embankment slope (no tailing sands included) to 8:1 slope by extension only with available earth materials and 1.5m of dirt cover; riprap 0.5m over total area, and no topsoil or vegetation; engineering and construction supervision 15% of total direct cost; and contingencies, 15% of total direct cost.

Table 6-1 of the DEIS presents a range of costs for disposing of the tailings in place and for moving them to below-grade disposal sites. Variations in costs for different levels of radon control are also shown. Table 4, infra at 34, shows the industry cost estimates for the "average pile" compared with EPA estimates for three levels of radon emanation control: 100, 10, and 2 pCi/m^2/ sec.

Table 4 also shows the estimate of total costs of disposal at all 24 inactive mill sites, assuming 17 are reclaimed in place and 7 are moved to new below-grade disposal sites (DEIS, Table 2-4, at 2-16 and 2-17). Based on EPA estimates, the total costs will vary from $50 to $200 million for tailings reclamation alone. Not included are the many other required remedial actions previously mentioned. Industry estimates show that the total cost for tailings reclamation alone could range from $140 to $450 million.

In summary, EPA's evaluation of costs is inadequate and must be reconsidered before issuing final standards.

CONCLUSION

For the foregoing reasons, EPA should reconsider its proposed cleanup and disposal standards for inactive uranium processing sites.

TABLE 1

COMPARISON OF UNIT COSTS FOR TAILINGS DISPOSAL

EPA (Table B-1, Appendix B) vs. Industry Experience

	UNIT COSTS, 1978 $		
	EPA		INDUSTRY
EARTHWORK - per m^3			
a. Below Grade Excavation	1.63		4.51 (1)
Below Grade Excavation in Shale	3.10		5.45 (1)
b. Dragline Excavation & Loading	1.53		1.80 (4)
c. Excavate, Load & Haul	1.13	2.84	5.00 (1)
d. Spread & Compact	0.38		
e. Haul, Dump, Spread & Compact	1.33		
CAPS AND LINERS			
a. Available Clay, m^3	2.07		2.80 (1)
b. Purchase Clay, m^3	5.00		6.76 (2)
c. Synthetic, m^2	4.41		10.00 (1)
d. Asphalt Emulsion (1/2" thick), m^2	1.76		2.10
STABILIZATION - per m^2			
a. Vegetation Soil Available	0.75		2.25 (1)
b. Vegetation Purchase Soil	2.51		7.50 (2)
c. Riprap (.5m thick)	12.90		18.18 (3)
d. Gravel (.5m thick)	2.57		2.68 (1)
e. Chemical	0.74		NE
FENCING - per meter			
a. Chain Link, 5 to 6 ft.	29.69		31.49 (1)
b. Security fence (Person Grade)	84.51		NE
IRRIGATION - per Hectare			
a. Equipment (Excluding Pumps)	1,070		NE
b. Annual Operating Costs	273		NE
c. Submersible Pump. ea.	1,000		1,000 (1)

(1) Union Carbide Corporation experience
(2) Factored EPA unit
(3) Berger Building Cost File 1981 western edition factored to 1978
(4) R. Snow Means (77)

NE = No Experience

TABLE 2

EPA vs. INDUSTRY COST ESTIMATES

Option 2 - Clay & Dirt Cover with Vegetation

Cover designed for
2 pCi/m^2 x sec

	EPA			INDUSTRY			
Case I Clay 0.6m, Dirt 1.5m, Veg.	Volumes, Areas, Lengths	Unit Price	Cost $M	Volumes, Areas, Lengths	Unit Price	Cost $M	Notes
Depth of Cover (m)	2.1			2.3			
Volume of Cover (m^3)	687,000			962,800			
Area of Cover (m^2)	281,000			284,100			
Lght. of Fence (m)	2,280			2,292			
Area w/i Fence (m^2)	324,000			328,300			
Earthwork	585,000 m^3	1.51	880	537,000 m^3	2.66	1430	
Cap (0.6m)							
Clay Available	101,500	2.07	210	103,800 m^3	2.80	290	
Clay Purchase	101,500 m^3	5.00	520	103,800 m^3	6.76	700	Factored EPA Unit
Stabilization							
Veg. No Soil Purchase	280,000 m^3	.75	210	274,300 m^3	2.25	620	
Soil Purchase	280,000 m^3	2.51	710	274,300 m^3	7.50	2060	Factored EPA
Riprap		12.90			18.18		
Fencing							
Chain Link	2,280 m	29.69	70	2,292 m	31.49	70	
Total			1370			2410	3130*
Purchase Veg.			1680			2820	3670*
Purchase Clay			1870			3850	5010*
Purchase Both			2080			4260	5540*

*Industry Total plus 15% for engineering and construction supervision and 15% for contingencies.

TABLE 3

EPA vs. INDUSTRY COST ESTIMATES

Option 2 - Clay, Dirt & Riprap Cover

Cover designed for
2 pCi/m^2 x sec

	EPA			INDUSTRY			
Case II Clay 0.6m, Dirt 1.5m, Riprap	Volumes, Areas, Lengths	Unit Price	Cost $M	Volumes, Areas, Lengths	Unit Price	Cost $M	Notes
Depth of Cover (m)	2.1			2.6			
Volume of Cover (m^3)	687,000			830,900			
Area of Cover (m^2)	281,000			289,400			
Lgth. of Fence (m)	2,280			2,312			
Area w/i Fence (m^2)	324,000			334,100			
Earthwork	585,500 m^3	1.51	880	537,000 m^3	2.66	1430	
Cap (0.6m)							
Clay Available	101,500 m^3	2.07	210	103,800 m^3	2.80	290	
Clay Purchase	101,500 m^3	5.00	520	103,800 m^3	6.76	700	Factored EPA Unit
Stabilization							
Veg. No Soil Purchase	280,000 m^3	.75	—	—	—	—	
Soil Purchase	—	—	—	—	—	—	
Riprap	281,400 m^2	12.90	3630	290,400 m^2	18.18	5340	
Fencing							
Chain Link	2,280 m	29.69	70	2,312 m	31.49	70	
Total			4790			7000	9100*
Purchase Clay			5100			7130	9270*
Purchase Veg.							
Purchase Both							

*Industry Total plus 15% for engineering and construction supervision and 15% for contingencies.

TABLE 4
COMPARISON OF COST ESTIMATES FOR RECLAIMING "Average Pile" and all Piles at Different Levels of Radon Emanation Rates

	Radon Level pCi/m² x sec	Cost in $Million	
		EPA	Industry
Average Pile			
Reclaim in place	100	0.6 - 4.3	1.5 - 8.2
	10	0.8 - 5.4	2.0 - 10.3
	2	1.0 - 6.3	2.5 - 12.0
Move and reclaim below grade	100	5.4 - 11.2	15.7 - 30.2
	10	5.8 - 12.5	16.8 - 33.8
	2	6.0 - 13.3	17.4 - 35.9
All Piles			
17 piles reclaimed in place	100	10 - 73	26 - 140
	10	14 - 92	34 - 175
	2	17 - 107	43 - 204
7 piles moved and reclaimed below grade	100	38 - 78	110 - 211
	10	41 - 88	118 - 237
	2	42 - 93	122 - 251
Total all piles	100	48 - 150	136 - 351
	10	55 - 180	152 - 412
	2	59 - 200	165 - 455

ATTACHMENT A

ATTACHMENT A

Residential Exposure Evaluation

Although it is very unlikely residential dwellings will be constructed on reclaimed overburden piles, the following calculations are presented to illustrate that Ra-226 concentrations of 20 pCi/g in the upper six feet of soil would not necessarily preclude such construction. Radium-226 is the precursor of Radon-222, a noble radioactive gas which may emanate from the soil into overlying building structures. Emanation of Radon-222 has been assumed to be the most limiting exposure route from the standpoint of residential use.

Concentrations of Ra-226 inside structures resulting from diffusion of Radon-222 from underlying soil may be estimated by the following equation and assumptions from Reference 1:

$$C = \frac{\phi AB}{V\lambda}$$

where:

C = Radon-222 concentration (pCi/m^3)

ϕ = Radon-222 flux (pCi/m^2-sec)

A = Area over which flux enters structure (m^2)

B = Flux reduction factor in entering structure

V = Volume of structure (m^3)

λ = Effective removal rate of Radon-222 from the structure

Calculations based on $B = 0.2$, $\lambda = 1.5$ hours^{-1}, $A/V = 0.41$, and 1 pCi/l Rn-222 = 0.005 WL.

The EPA, in its proposed hazardous waste regulations, has suggested that land reclaimed by filling "...shall be used for residential development only where provisions have been made to prevent alpha radiation exposure from Radon-222 inhalation from exceeding background levels by 0.03 Working Level Units...". (Reference 2.)

By rearranging the above equation, the Radon-222 flux can be calculated which will yield a 0.03 WL concentration inside a structure. Table 1 shows the relationship between working level concentration, effective removal rate, and radon flux. For use in evaluating the proposed 20 pCi/g Ra-226 concentration in the upper six feet of soil, a more conservative radon concentration of 0.02 WL and its associated flux of 20.3 pCi/m^2-sec were utilized. It should be noted, however, that for a Radium-226 concentration of 20 pCi/g to infinite depth, the calculations show a radon concentration on the order of 0.01 WL. The maximum Ra-226 concentration in soil to an infinite depth which would produce a Rn-222 flux of 20.3 pCi/m^2-sec is 30 pCi/g.

Radon-222 fluxes were calculated following the methods of Momeni, et al., and Clements, et al., utilizing a median value of 7.78×10^{-3} cm^2/sec for the effective diffusion coefficient and a value of 0.37 for the void fraction which would result in an effective diffusion length of 100cm for Radon-222, (References 3 and 4). These values are considered typical for soils in the Western United States. Table 2 presents the radon flux data from cover soil containing 20 pCi/g of Ra-226 and underlying waste rock containing varying concentrations of Ra-226 such that the total surface Radon-222 flux does not exceed 20.3 pCi/m^2-sec (equivalent to 0.02 WL). These calculated radon fluxes readily show that six feet of cover material containing an average of 20 pCi/g of Ra-226 can be used to cover waste rock containing up to an average 70 pCi/g of Ra-226. If the underlying waste rock contains concentrations averaging greater than 70 pCi/g of Ra-226, then a greater depth of 20 pCi/g average cover material would have to be applied to achieve a radon concentration inside structures of 0.02 WL.

The assumptions utilized in calculating the surface Radon-222 flux are thought to be very conservative since a diffusion distance for low moisture content, uncompacted soil was used. The mode of development of mining waste dumps is such that the waste material usually becomes highly compacted by the repeated movements of heavy equipment. Therefore, the Radon-222 diffusion distance would be expected to be much shorter in the compacted waste materials and the resultant surface radon flux would be expected to be much lower than the values shown in Table 2.

I-10

TABLE 2

Total Surface Radon-222 Flux
Obtained by Varying Depth of Cover Material
And Ra-226 Concentration
In Underlying Waste Material

ith of er Soil (ft)	Ra-226 Conc. In Cover Soil (pCi/g)	Rn-222 Flux @ Surface From Cover Soil (pCi/m^2-sec)	Ra-226 Conc. In Underlying Waste Rock (pCi/g)	Attenuated Rn-222 Flux @ Surface From Waste Rock (pCi/m^2-sec)	Total Rn-222 Flux @ Surface (pCi/m^2-sec)
6'	20	12.8	70.1	7.5	20.3
7'	20	13.0	90.2	7.3	20.3
8'	20	13.2	118.0	7.1	20.3
9'	20	13.3	173.8	7.0	20.3
10'	20	13.4	206.1	6.9	20.3
11'	20	13.4	293.2	6.9	20.3
12'	20	13.4	394.1	6.9	20.3
13'	20	13.4	538.5	6.9	20.3
14'	20	13.4	730.8	6.9	20.3
15'	20	13.4	1023.2	6.9	20.3
-	20	13.4	-	0	13.4

10 of 635

I-10

TABLE 1

Relationship of Soil Surface Radon-222 Flux To Working Levels and Effective Removal Rates (λ) Within Structures

	Rn-222 pCi/m^2-sec		
	0.01 WL	0.02 WL	0.03 WL
λ=1/hr	6.8	13.6	20.3
λ= 1.5/hr	10.2	20.3	30.5
λ= 2/hr	13.6	27.1	40.6

REFERENCES

1. "Interim Land Cleanup Criteria for Decommissioning Uranium Mill Site", U.S. Nuclear Regulatory Commission, Staff Technical Position, Fuel Processing and Fabrication Branch, May 1979.

2. Federal Register, Environmental Protection Agency, Hazardous Waste, Proposed Guidelines and Regulations and Proposal or Identification and Listing, December 18, 1978, Part IV.

3. Momeni, M.H., Kisieleski, W.E., Tyler, S., Zielen, A., Yuan, Y.C., and Roberts, C.J., "Radiological Impact of Uranium Tailings and Alternatives for Their Management", presented at the Health Physics Society Twelfth Midyear Topical Symposium on Low Level Radiation Waste Management, Division of Environmental Impact Studies, Argonne National Laboratory, Argonne, Illinois, February 11, 1979.

4. Clements, W.E., Barr, S., and Marple, L., "Uranium Mill Tailings Piles as Sources of Atmospheric ^{222}Rn", presented at Natural Radiation Environment III, Houston, Texas, LA-UR 78-828, University of California Los Alamos Scientific Laboratory, Los Alamos, New Mexico, April 23-28, 1978.

ATTACHMENT B

ATTACHMENT B

Analytical Study of Radium in Soil Samples

The following Table lists the results of a comparative analytical study for radium-226 concentrations in aliquots from 10 soil samples. Participating in the study were two government laboratories, three commercial laboratories, and five industrial laboratories. Most of these laboratories have been conducting radium analyses for many years.

Sample Preparation

Samples were dried at 105° C to a constant weight. Organic material such as twigs, leaves and roots was removed. No large rocks were included when the samples were received. Small stones (¼" diameter and smaller) were included as part of the sample when present.

Since these samples were relatively small samples at the time of collection (250-500 grams), the customary steps of successive size-reduction accompanied by splitting and blending prior to pulverizing was omitted. The entire sample was pulverized in a Braun pulverizer and passed through a U.S. standard testing sieve, No. 200. Each pulverized sample was carefully blended in a bottle blender prior to withdrawing the individual pulps which were distributed for assay.

Reporting of Results

This test is basically a test of precision, i.e., the ability of individual laboratories to assay the same sample. No attempt was made to quantify the radium content of the samples prior to distribution, although a lot of effort was spent trying to make sure the samples were carefully blended and split.

One additional column shows the statistical mean and the standard deviation from statistical mean. Only the reported value was used in calculating the mean; the reported deviation was not considered. A Hewlett-Packard calculator was used to calculate the $\overline{X}$ and S, the formula for this being:

$$s = \sqrt{\frac{\Sigma x^2 - \frac{(\Sigma x)^2}{n}}{n - 1}} \qquad \overline{X} = \frac{\Sigma x}{n}$$

Analytical Study of Radium in Soil Samples

Radium-226, pCi/gram

Sample No.	Laboratory Designation										Mean	Standard Deviation
	A	B	C	D	E	F	G	H	I	J		
1	5.5 ± 0.2	2.48 ± 0.08	8.6 ± 2.5	1.64 ± 0.45	0.00 ± 0.02	1.05 ± 0.28	1.72 ± .04	2.0 ± .25	2.83 ± .69	3.3 ± 1.7	2.91	± 2.48
2	7.1 ± 1.3	2.10 ± 0.06	7.9 ± 2.3	1.40 ± 0.46	0.45 ± 0.01	1.08 ± 0.27	1.57 ± .03	2.2 ± .25	2.02 ± .61	2.7 ± 1.6	2.85	± 2.54
3	8.7 ± 0.9	5.33 ± 0.12	9.2 ± 2.7	3.46 ± 0.62	2.2 ± 0.1	6.44 ± 0.71	2.14 ± .04	4.9 ± .38	5.59 ± .92	5.1 ± 2.1	5.31	± 2.39
4	14.6 ± 0.3	8.9 ± 0.2	16.6 ± 4.8	6.05 ± 0.80	3.9 ± 0.1	9.34 ± 0.81	3.94 ± .06	8.4 ± .50	10.01 ± 1.19	6.6 ± 2.5	8.95	± 4.12
5	7.8 ± 0.5	2.06 ± 0.06	8.2 ± 2.4	1.94 ± 0.52	1.3 ± 0.1	1.54 ± 0.36	2.16 ± .04	2.8 ± .38	2.22 ± .63	1.3 ± 1.3	3.21	± 2.58
6	10.1 ± 1.5	2.45 ± 0.06	10.4 ± 3.0	2.59 ± 0.56	2.0 ± 0.1	3.45 ± 0.50	3.03 ± .05	4.3 ± .36	4.36 ± .82	4.5 ± 1.9	4.72	± 3.06
7	5.1 ± 0.4	3.94 ± 0.08	5.9 ± 1.7	2.01 ± 0.49	1.1 ± 0.1	2.77 ± 0.43	1.86 ± .04	2.3 ± .27	2.97 ± .71	2.5 ± 1.5	[illegible]	± 1.52
8	6.4 ± 0.6	3.31 ± 0.07	5.4 ± 1.6	2.30 ± 0.46	0.41 ± 0.01	1.82 ± 0.36	2.58 ± .05	1.0 ± .30	3.24 ± .73	2.7 ± 1.7	3.12	± 1.70
9	11.7 ± 1.7	9.1 ± 0.2	11.7 ± 3.4	6.78 ± 0.70	1.0 ± 0.1	1.12 ± 0.30	2.67 ± .05	9.3 ± .53	8.98 ± 1.13	11.4 ± 2.8	7.38	± 4.20
10	13.5 ± 1.4	13.1 ± 0.2	16.2 ± 4.7	9.74 ± 0.88	6.8 ± 0.1	7.40 ± 0.72	0.86 ± .11	12.3 ± .61	12.59 ± 1.32	14.4 ± 3.2	11.59	± 3.06

ipating Laboratories: 2 Government
3 Commercial
5 Company

May 7, 1979

S-1

STATE OF IDAHO

DEPARTMENT OF HEALTH
AND WELFARE

DIVISION OF ENVIRONMENT
Statehouse
Boise, Idaho 83720

A-79-25
II-D-2

May 15, 1980

RECEIVED
ENVIRONMENTAL PROTECTION
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CENTRAL DOCKET
SECTION

EPA Central Docket Section
Room 2903 B
401 M Street SW
Washington, D.C. 20460

Subject: Docket #A-79-25

Dear Sirs:

I would like to offer comments on the proposed EPA Standards for Inactive Uranium Processing Sites.

192.12(a) The concentration of 5pCi/gram is very low. There are areas that exist that occur naturally in excess of this standard. The areas where tailings have been left are usually higher in mineral content such as Radium-226 and the over cover or top soil may exceed 5pCi/gram.

672.12(b) Table B. Average annual Working Levels... .015. Indoor gamma radiation levels .02 millirem/hr.

Natural aggregate used by concrete companies has radioactive levels ranging from .016 to .020. Asphalt in the streets of Pocatello, Idaho, is running .025-.040 millirem/hr.

The standards are too low and should be raised a factor of two to allow for natural occurring radioactive materials. The level of .015 W.L. for indoor radon is questionable because of the methodology in obtaining such a low standard.

Thank you for your time.

Yours truly,

Robert D. Funderburg
Robert D. Funderburg
Manager
Radiation Control Section

fdn

EQUAL OPPORTUNITY EMPLOYER

S-2

Scott M. Matheson
Governor

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State Planning Coordinator

A-79-25
II-D-10

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Received
Criteria & Standards Division, ORP
Date:
JUN 26 1980

June 19, 1980

Dr. Stanley Lichtman
c/o Central Docket Section
Room 2903B - 401 M Street, SW
Washington, D.C. 20460

Subject: 40 CFR, 192 Cleanup Standards Inactive Uranium Processing Sites Docket No. A-80-25 - FR 4-22-80

Dear Dr. Lichtman:

I appreciate the opportunity to respond to the proposed Cleanup Standards. The Division of Environmental Health reviewed the proposal and makes the following comments and suggestions:

1. To eliminate difficulty in meeting Radon Decay Product Concentration limits in areas where the natural concentrations may be high, they suggest adding an alternative limit of .010 WL above background. Table B would be modified to read:

   Average Annual Indoor
     Radon Decay Product Concentration
     (including background) . . . . .0.015 WL
     or (above background) . . . . .0.010 WL

2. Paragraph 192.12(c) complicates the standard by using the term "cumulative lifetime radiation dose equivalent" and including "byproduct materials." We suggest that this paragraph be eliminated.

3. The definitions in 192.11(d) and (f) use the word "billion" which is not specific in meaning. It means 10^9 in the United States and 10^{12} in some other countries. Although this standard is currently addressed to sites in the United States, the use of scientific notation is suggested to eliminate any ambiguity.

Dr. Stanley Lichtman
Page Two

I hope you will find these comments useful in deciding upon your final Cleanup Standards. If you have questions, please contact Pat Woodruff at (801) 533-6083.

Sincerely,

Kent Briggs

Kent Briggs
State Planning Coordinator

KB:jk

cc: Department of Health
Division of Environmental Health

A-79-25
II-D-9

STATE OF WYOMING

ED HERSCHLER
GOVERNOR

Department of Environmental Quality

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U.S. Environmental Protection Agency
Washington, DC 20460

RE: Interim Cleanup Standards for Inactive Uranium Processing Sites (Docket No. A-79-25).

Dear Dr. Lichtman,

This office has reviewed the proposed standards for cleanup of inactive uranium processing sites (40 CFR 192, April 22, 1980). The standards of §192.12 including the flexibility of subpart C appears very acceptable and should be workable. However, § 206(a) of P.L. 95-604 requires standards for both radiological and nonradiological hazards. DOE in implementing its remedial action programs, should address both radiological and nonradiological hazards of these wastes. I know that if the State is going to participate in such a clean-up, we want to do it all at one time. I believe DOE shares this opinion.

When and under what circumstances can we expect standards for nonradiological hazards to be established which will provide guidance for the remedial action program?

Sincerely,

W. C. Ackerman

Walter C. Ackerman
Administrator

WCA:GB:sh
cc: Paul Wagner, EPA
Bob Sundin, DEQ
Dr. William Mott, DOE

S-4

MISSOURI DEPARTMENT OF NATURAL RESOURCES
P.O. Box 1368 2010 Missouri Blvd. Jefferson City, Missouri 65102 (314) 751-3241

A-79-25
IV-D-12

RECEIVED
ENVIRONMENTAL PROTECTION
AGENCY
JUL 11 1980
CENTRAL DOCKET
SECTION

July 3, 1980

Environmental Protection Agency
Central Docket Section
Docket A-79-25
Room 2903-B
401 M Street S.W.
Washington, D.C. 20460

Dear Sir:

Since the comment period for the proposed cleanup standards for inactive Uranium processing sites (40CFR192) published in the Federal Register on April 22, 1980 has been extended, I will take this opportunity to provide some input.

These regulations seem to be far superior to many regulations of the past because they take cost-effectiveness into consideration. The regulations address concentration of radioactive substances in the soil and levels of radioactivity in buildings on inactive uranium processing sites; however, no attention is given, in the regulations, to levels of radioactivity or concentrations of radioactive substances in water retention ponds, raffinate pits, waste stabilization lagoons, or holding basins on these premises.

A great deal of water is used in the purification and processing of uranium. I feel that regulations regarding cleanup of processing sites should provide guidance on dealing with the process water.

A timely reply will be greatly appreciated.

Sincerely,

Burt McCullough

Burt McCullough
Environmental Specialist
Water Pollution Control Program
Missouri Department of Natural Resources

BM/lo

Joseph P. Teasdale Governor
Fred A. Lafser Director

Division of Environmental Quality
[redacted] Director

S-5

COLORADO DEPARTMENT OF HEALTH

1876

Richard D. Lamm
Governor

Frank A. Traylor, M.D.
Executive Director

A-79-25-IV-D-13

July 17, 1980

RECEIVED
ENVIRONMENTAL PROTECTION
AGENCY
AUG 08 1980
CENTRAL DOCKET
SECTION

Mr. Douglas M. Costle, Administrator
U.S. Environmental Protection Agency
401 M Street, SW
Washington, D.C. 20460

Dear Mr. Costle:

This letter transmits the state of Colorado's comments on the "Proposed Cleanup Standards for Inactive Uranium Processing Site; Invitation for Comment" published under 40 CFR Part 192 as printed in the Federal Register dated Tuesday, April 22, 1980 (Volume 45, Number 79, pages 27370-27375) and others.

With regard to the numerical values identified in Table B, the values are essentially equivalent to the values currently in use for the Grand Junction Remedial Action Program (0.010 + 0.007 WL (background)). I am aware of the comments provided by Ruth C. Clusen, DOE, in her June 13, 1980 letter and find the DOE argument without substance with regard to the radon decay product concentration standard. However, it is unclear as to how EPA intends the standards listed in Table B to apply to a maximally exposed individual, i.e., room, house, building, etc. Clarification appears to be a necessity as to the intent in this regard.

I do not take issue with the EPA proposal with regard to the soil standard of 192.12(a) of 5 pCi Radium-226/gram of soil. I do have a serious concern for the mechanism by which compliance is to be demonstrated. Depending on the bureaucracy emplaced, the cost of demonstrating compliance could far exceed estimates of the entire project. It should also be pointed out that over-digging of a contaminated site results in enormous volume of soil to transport to a disposal site and its associated fiscal impact. Our experience on such matters identifies requirements for prudent field judgment and documentation. Extensive bureaucratic agency approvals are not cost/effective.

S-5

Mr. Douglas M. Costle, Administrator
July 17, 1980
Page 2

With regard to Subpart C - Exceptions, we acknowledge the comment of DOE on number of locations that did not attain an acceptable reduction of radiation exposure from initial remedial action efforts. The 32% referenced includes initial actions made early in the Grand Junction Program when thorough evaluations of the deposits were not made. The track record of the current efforts achieves a better percentage.

A more important matter is that when an exception is deemed appropriate by DOE, the agency must obtain the concurrence of NRC and inform the EPA. My concern again is with the level of bureaucracy the program is burdened with. The purpose of the entire effort is to significantly reduce the radiation exposure of the public so effected. The criteria for eligibility for inclusion into the program should be those identified in 192.12, as published, but the provision of exceptions should only require sufficient documentation to meet the criteria specified in 192.20. NRC has only to concur in the proposed remedial action as provided by PL 95-604. As such information is a public record, such records are available to NRC and EPA for their review.

I sincerely hope these comments will be of use to you in appropriately amending 40 CFR 192.

Sincerely,

Albert J. Hazle, Director
Radiation and Hazardous
Wastes Control Division

AJH:bjw

cc: Dr. Frank Traylor, CDH
Governor's Office
Ruth M. Clusen, DOE

S-6

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES
Post Office Box 2063
Harrisburg, Pennsylvania 17120
(717) 787-3720

August 8, 1980

Environmental Protection Agency
Central Docket Section
Room 2903 B
401 "M" Street, SW
Washington, D.C. 20406

Reference: A-79-25

Gentlemen:

This refers to the proposed and interim cleanup standards for inactive uranium processing sites contained in the Federal Register, dated Tuesday, April 22, 1980.

We agreed totally with the statements and comments contained in the June 13, 1980 letter from Ruth C. Clusen, Assistant Secretary for Environment, Department of Energy to Douglas M. Costle, Administrator, Environmental Protection Agency. The standards for open lands and indoor radon decay product concentration, as published, are not practical in every case. For your information, we are enclosing a copy of the letter referenced above.

Like the Department of Energy, we hope you will be able to solve these issues prior to the promulgation of final standards.

Very truly yours,

C McDonald for
THOMAS M. GERUSKY, Director
Bureau of Radiation Protection

Enclosure

cc: William E. Mott

RECEIVED
ENVIRON[illegible] PROTECTION
CENT[illegible]
SECTION

S-7

Robert List
Governor

The State of Nevada
Executive Chamber

Capitol Complex
Carson City, Nevada 89710

A-79-25
IV-D-21

RECEIVED
ENVIRONMENTAL PROTECTION
AGENCY
APR 09 1981
CENTRAL DOCKET
SECTION

March 3, 1981

Mr. David M. Rosenbaum
Deputy Assistant Administrator
for Radiation Programs
United States Environmental Protection Agency
Washington, D. C. 20460

Dear Mr. Rosenbaum:

Thank you for your recent letter regarding proposed disposal standards for uranium tailings.

It appears that the principle of "cost versus benefit" has not been adequately considered in the development of the radon emission standard.

In the discussion of the proposed standard for an emission rate for radon, the statements are made that "the current emission rate from the tailings piles of several hundred picocuries of radon per square meter per second should be reduced to two picocuries of radon per square meter per second." Further, the standard is supposed to "reduce radon emissions and their effects by 99 percent." The effect of the uncovered 22 tailings piles located in eight western states and one eastern state is given as two premature deaths from lung cancer per year, in the total U. S. population. To obtain the 99 percent reduction in radon emission would require covering all the tailings piles with ten feet of dirt at the cost of many millions of dollars. We believe that a reduction of 30 to 50 percent of the effects of radon emissions is more practical, particularly if the millions saved is put to use in other life-saving programs.

Sincerely,

R. L.
ROBERT LIST
Governor

S-8

SALT LAKE CITY-COUNTY
HEALTH DEPARTMENT

610 South 2nd East, Salt Lake City, Utah 84111
Phone: 532-2002

TERRY D. SADLER, Director
Division of Environmental Health

A-79-25
IV-D-20

BOARD OF HEALTH
L. C. ROMNEY, Chairman
WILLIAM L. HUTCHINSON, Commissioner
Salt Lake County
WAYNE BAER
C. D. CLARK, D.D.S.
JAMES W. DAVIS, Mayor
South Salt Lake
L. JED MORRISON, M.D.
LARELL D. MUIR, Mayor
Murray City
RALF C. RICHES, Ed.D.
RULON SIMMONS, M.D.
ROBERT L. SORBONNE, D.D.S.
W. PAUL THOMPSON, Mayor
Sandy City
SANDRA K. ERCANBRACK
Secretary

HARRY L. GIBBONS, M.D. M.P.H.
Director of Health

RECEIVED
ENVIRONMENTAL PROTECTION
AGENCY
[illegible] 1981
CENTRAL DOCKET
SECTION

March 16, 1981

U.S Environmental Protection Agency
Docket No. A-79-25
West Tower, Gallery 1
401 M Street
S. W., Washington, D.C. 20460

Dear Sirs:

The Salt Lake City-County Health Dept. has been an active participant in preparing the Vitro Uranium Mill Tailings Pile for remedial action under PL 95-604. I am pleased to see the proposed final cleanup standards promulgated in the Federal Register since we are now that much closer to resolving the Vitro problem.

I believe that the proposed standards will provide the measure of protection mandated by the Congress. Further, I am pleased that there will be no need to re-evaluate or reclassify involved properties due to radically altered interim standards.

I wish to lend our full support for the codification of the final rule.

Sincerely,

Terry Sadler
Terry D. Sadler, Director
Division of Environmental Health

TDS:BLH:ln

STATE OF KANSAS
DEPARTMENT OF
Administration

DIVISION OF THE BUDGET

Room 152-E, State Capitol
Topeka, Kansas 66612
913-296-2436
KANS-A-N 561-2436

A-79-25
IV-D-42

RECEIVED
ENVIRONMENTAL PROTECTION
AGENCY
MAY 13 1981
CENTRAL DOCKET
SECTION

April 6, 1981

Mr. Stanley Lichtman, Project Leader
In Care of the Director
Criteria & Standards Division
Office of Radiation Programs
U.S. Environmental Protection Agency
401 M Street, S.W.
Washington, D.C. 20460

REF: E.I.S. for Remedial Action
Standards for Inactive
Uranium Processing Sites
SAI: 9401

Dear Mr. Lichtman:

The above referenced project has been processed by the Division of the Budget under its clearinghouse responsibilities as described in the Federal Office of Managment and Budget Circular A-95.

After review by interested state agencies, it has been found that the proposed project does not adversely affect state plans. Enclosed is a comment concerning this project for your information and referral.

If you need any additional clarification of information regarding the state clearinghouse's action please contact this office.

Sincerely,

LYNN MUCHMORE
Director of the Budget

By: Alan D. Conroy
Alan D. Conroy
A-95 Coordinator

LM:ADC:mfl

Attachment

STATE AGENCY A-95 TRANSMITTAL FORM

Return to: Division of the Budget, Department of Administration, 1st Floor,
Capitol Building, Topeka, Kansas 66612

PROJECT TITLE: U.S. Environmental Protection Agency
E.I.S. for Remedial Action Stds. for Inactive Uranium Processing Sites

☐ Notification of Intent
☐ Preapplication
☐ Final Application

DATE REVIEW PROCESS STARTED	DATE REVIEW PROCESS ENDED	SAI NUMBER
3-9-81	ASAP	9401

PART I Initial Project Notification Review (To be completed by Clearinghouse):

The attached project has been submitted to the State Clearinghouse under the provisions of the Federal OMB Circular A-95 revised. This form provides notification and opportunity for review of this project to the agencies checked below. Please fill in Part II and Part III below and return to the State Clearinghouse.

☒ Return by ASAP
☐ Expedite
☐ Add. Info. Avail.

REVIEW AGENCIES

☐ Aging
☐ Agriculture - DWR
☐ Civil Rights Commission
☐ Economic Development
☐ Education
☐ Fish and Game Commission
☒ Health and Environment
☐ Historical Society
☐ Human Resources
☐ Kansas Corporation Commission
☐ Park and Resources Authority
☐ Social and Rehabilitation Services
☐ State Conservation Commission
☐ Transportation
☐ Water Resources Board
☐ ____________

PART II Nature of Agency review comments (To be completed by review agency and returned to CH)

Check one or more appropriate boxes. Indicate comments below. Attach additional sheet if necessary or use reverse side.

☐ Request clarification or additional info. ☐ Suggestions for improving project proposa

COMMENTS:

PART III Recommended State Clearinghouse Action (To be completed by review agency and returned to Clearinghouse):

Check one box only:

☐ Clearance of the project should be granted

☐ Clearance of the project should be delayed until the issues or questions have been clarified by the Applicant

☐ Clearance of the project should not be delayed but the Applicant should (in the final application) address or clarify the questions or concerns indicated above

☒ Request the opportunity to review the final application prior to submission to the federal funding agency

Reviewer's Name	Div./Agency	Date
C. W. Allen	Bureau Rad Control	March 27, 1981

S-10

A-79-25
IV-D-30a

STATE CLEARINGHOUSE
30 EAST BROAD STREET • 39TH FLOOR • COLUMBUS, OHIO 43215 • 614 / 466-7461

81-04-17
09
P

RECEIVED
ENVIRONMENTAL PROTECTION AGENCY
MAY 13 1981
CENTRAL DOCKET SECTION

Dr. Stanley Lichtman
U. S. Environmental Protection Agency
West Town Gallery 1
401 M Street, SW
Washington, D.C. 20460

RE: Review of Environmental Impact Statement/Assessment
Title: Draft Environmental Impact Statement for Remedial Action Standards for Inactive Uranium Processing Sites. Statewide
SAI Number: 36-552-0004

Dear Mr. Lichtman:

The State Clearinghouse coordinated the review of the above referenced environmental impact statement/assessment.

This environmental report was reviewed by all interested State agencies. No reviewers has stated concerns relating to this report.

Thank you for the opportunity to review this statement/assessment.

Sincerely,

Judith Y. Brachman

Judith Y. Brachman
Administering Officer

JYB:alf

cc: DNR, Mike Colvin
EPA, Mary Rhodes

S-11

STATE OF NEVADA
GOVERNOR'S OFFICE OF PLANNING COORDINATION
CAPITOL COMPLEX
CARSON CITY, NEVADA 89710
(702) 885-4865

May 4, 1981

Mr. William A. Mills, Ph. D.
Director
Criteria & Standards Division
Office of Radiation Programs
U.S. Environmental Protection
Washington, D.C. 20460

RE: SAI NV #81300036 Project: Remedial Action Standards
Inactive Uranium Processing Sites

Dear Dr. Mills:

Attached are the comments from the following affected State Agencies: Division of Health concerning the above referenced project.

These comments constitute the State Clearinghouse review of this proposal. Please address these comments in the final or summary report.

Sincerely,

Mike Nolan

Mike Nolan for
Robert Hill
State Planning Coordinator

RH/MN/jg
Enclosure

RECEIVED
CRITERIA & STANDARDS DIVISION, ORP
DATE: MAY 11 1981

Comments: *(use additional sheets if necessary)*

It appears that the principle of "cost versus benefit" has not been adequately considered in the development of the radon emission standard.

In the discussion of the proposed standard for an emission rate for radon, the statements are made that "the current emission rate from the tailings piles of several hundred picocuries of radon per square meter per second should be reduced to two picocuries of radon per square meter per second." Further, the standard is supposed to "reduce radon emissions and their effects by 99 percent." The effect of the uncovered 22 tailings piles located in eight western states and one eastern state is given as two premature deaths from lung cancer per year, in the total U.S. population. To obtain the 99 percent reduction in radon emission would require coverning all the tailings piles with ten feet of dirt at the cost of many millions of dollars. We believe that a reduction of 30 to 50 percent of the effects of radon emissions is more practical, particularly if the millions saved is put to use in other life-saving programs.

RECEIVED
APR 03 1981
Consumer Health
Protection Services

J D Vaden	Supv. Radiological Health	4530	4-17-81
Reviewer's Signature	Title	Phone	Date

OKLAHOMA DEPARTMENT OF ECONOMIC AND COMMUNITY AFFAIRS
State Grant-In-Aid-Clearinghouse
5500 N. WESTERN OKLAHOMA CITY, OKLAHOMA 73118 (405) 840-2811

May 7, 1981

Dr. Stanley Lichtman
U. S. Environmental Protection Agency
Docket No. A-79-25
West Tower Gallery 1
401 M Street, S.W.
Washington, D.C. 20460

RE: 09D102 - Draft Environmental Impact Statement for Remedial Action Standards for Inactive Uranium Processing Sites (SAI #810507-001)

Dear Dr. Lichtman:

The environmental information for the above referenced project has been reviewed in accordance with OMB Circular A-95 and Section 102 (2) (C) of the National Environmental Policy Act by the state agencies charged with enforcing environmental standards in the State of Oklahoma.

The state agencies, comprising the Pollution Control Coordinating Board, have reviewed the proposed project and agree that no adverse environmental impact is anticipated. Therefore, the state clearinghouse requires no further review.

Sincerely,

Don N. Strain
Director

DNS:mt

S-13

Executive Department
155 COTTAGE STREET N.E., SALEM, OREGON 97310

May 7, 1981

William A. Mills, Ph.D.
Director
Criteria & Standards Division (ANR-460)
Office of Radiation Programs
U.S. Environmental Protection Agency
Washington, D.C. 20460

Dear Mr. Mills:

Remedial Action Standards for Inactive Uraninum Processing Sites
PNRS 8103 4 360

Thank you for submitting your draft Environmental Impact Statement for State of Oregon review and comment.

Your draft was referred to the appropriate state agencies for review. The consensus among reviewing agencies was that the draft adequately described the environmental impact of your proposal.

We will expect to receive copies of the final statement as required by Council of Environmental Quality Guidelines.

Sincerely,

INTERGOVERNMENTAL RELATIONS DIVISION

Kay L. Wilcox

Kay Wilcox
A-95 Coordinator

KW:cb

RECEIVED
CRITERIA & STANDARDS DIVISION, ORP.
DATE MAY 13 1981

S-14

A-79-25
IV-D-49

COLORADO DEPARTMENT OF HEALTH
Richard D. Lamm
Governor
Frank A. Traylor, M.D.
Executive Director

May 8, 1981

RECEIVED
ENVIRONMENTAL PROTECTION AGENCY
MAY 18 1981
CENTRAL DOCKET SECTION

Environmental Protection Agency
Central Docket Section
West Tower Lobby
401 M Street SW
Washington, D.C. 20460

RE: Docket No. A-79-25 - January 9, 1981 Federal Register

Dear Gentlemen:

Colorado has several active or proposed uranium mills plus numerous inactive uranium piles. As we are an Agreement State with the NRC the Water Quality Control Division has provided technical assistance to the state licensing authority for several new and existing uranium mills.

At this time, the Colorado Attorney General interprets uranium tailings piles to be subject to control under C.R.S. 1973, 25-8-505. This section of the Water Quality Control Act addresses groundwater and requires one of two findings before the activity is permitted. The findings are: a) that no waters of the State will be polluted thereby; or b) that if waters of the State will be polluted thereby, the pollution resulting therefrom will be limited to waters in a specified limited area from which there is no risk of significant migration and the proposed activity is justified by public need. The Division has recommended finding b) above, for the one operation which has applied for a permit. Though distance and contaminant level criteria do not exist, the proposed design will provide reasonable assurance for groundwater protection. To be reasonably consistant with this Act, it is recommended that the proposed numeric limits be imposed at a distance no greater than 0.1 kilometers from either an existing pile or a relocated pile. Nondegradation should be the criteria when natural background levels exceed the numeric criteria. Part of the reason for this is the fact that, according to limited groundwater data in the 1977 Ford, Bacon and Davis Utah, Inc. reports on the inactive sites in Colorado, many of the piles have a potential for saturation during high stream flows. This being the case, it would be very possible for a pile to be impacting groundwaters yet not see the impact 1 kilometer from the site because of seepage migration into surface waters. As the placement of uranium tailings was previously based upon practicality and not good siting criteria, monitoring close to the pile will make it more difficult for a poor site to be accepted for final disposal. As saturation of the piles may be periodic, extended periods of groundwater monitoring may be required at existing sites to factually determine site adequacy for the 1000 year period.

4210 EAST 11TH AVENUE DENVER,COLORADO 80220 PHONE (303) 320-8333

S-14

One additional reason for imposing criteria close to a site, is the fact that most if not all the inactive piles are located in semi-arid areas. As these same areas are being impacted by great population increases and increased energy activities, the demands on the limited waters are increasing.

The chemical and radiological characteristics of seepage from a uranium pile are dependent on factors such as leaching process, ore source, soil characteristics, etc. At the Cotter mill in Canon City, molybdenum and uranium were found to be two of the most mobile metals in the groundwaters. Selenium was found to be somewhat mobile and arsenic though present in ponds, could not be found in adjacent groundwaters. The groundwaters near other sites have shown elevated levels of thorium 230 and lead 210. Due to the fact that mobility of a given parameter at a given location will indicate its value as an identifier of seepage, the proposed list of parameters plus thorium 230, lead 210 and vanadium should serve as suitable criteria. At this time, a suggested numeric limit for these three parameters cannot be made. For a given site, once the best indicators of contamination are identified, the remainder of the parameters should be of secondary importance.

One additional criteria which should be included in the standards is the location of the final disposal pile out of the floodplain of a probable maximum flood event, for any adjacent drainage. Location within such a floodplain can cuase erosion as well as saturation of portions of the pile which will not allow compliance with the 1000 year cirteria.

The primary concern of this Division is that the proposed rules would make the acceptance of existing sites as the final disposal site too simple. It is very likely that none of the existing uranium pile locations in Colorado would be acceptable for siting of a new pile. As congress has determined that proper isolation of inactive uranium piles is needed, the standards should be sufficient to insure that the uranium piles are not left at a marginal site.

One general point of concern is the indication in the Federal Register that limited groundwater impact is occurring at most sites. In review of the specific site reports of 1977 by Ford, Bacon and Davis Utah, Inc. limited data was available upon which to make any determination. If the feeling of limited impact continues, it may bias the standards before they are finalized.

Should there be any question on these comments, please contact this office.

Sincerely,

Robert J Shukle

Robert J. Shukle, P.E.
Unit Chief, Industrial Unit
Permits Section
Water Quality Control Division

RJS/ky

cc: Al Hazle

S-15

JOHN V. EVANS
GOVERNOR

OFFICE OF THE GOVERNOR
STATE CAPITOL
BOISE 83720

May 11, 1981

Dr. Stanley Lichtman
Criteria & Standards Division
(ANR-460)
Office of Radiation Programs
U. S. EPA
Washington, D.C. 20460

Dear Dr. Lichtman:

RE: Docket #A-79-25

We have reviewed the Proposed Cleanup and Disposal Standards for Inactive Uranium Mill Sites (40 CFR 192) which we assume will be applicable to the abandoned uranium mill site near Lowman, Idaho.

The standards appear to be practical and our enclosed comments are general in nature.

We appreciate this opportunity for input on the vital issue of radioactive waste disposal.

Sincerely,

John V. Evans

JOHN V. EVANS
GOVERNOR

JVE/bf
Enclosure

S-15

Docket #A-79-25

Comments on EPA's Proposed Cleanup and Disposal Standard for Inactive Uranium Processing Sites (10 CFR 192)

A. Open Lands (192.12(a)) - The proposed contamination level of 5pCi/gm Ra-226 is low and such levels may be hard to find in a facility.

B. Indoor Rn Daughter Concentration (192.12(b)) - .015 WL is low from histories of studies in Colorado; a better limit might be .025 WL.

C. Indoor Gamma (192.12(b)) - The standard of 20 μR/hr is low and leaves no options to final disposition of tailings except removal.

S-16

STATE OF NEW MEXICO
DEPARTMENT OF
FINANCE AND ADMINISTRATION
STATE PLANNING DIVISION

505 DON GASPAR AVENUE
SANTA FE, NEW MEXICO 87503
(505) 827-2073
(505) 827-5191
(505) 827-2108

BRUCE KING
GOVERNOR

ATHLEEN R. MARR
SECRETARY

ANITA HISENBERG
DIRECTOR

JOE GUILLEN
DEPUTY DIRECTOR

May 22, 1981

RECEIVED
ENVIRONMENTAL PROTECTION
AGENCY
JUN 15 1981
CENTRAL DOCKET
SECTION

Dr. Stanley Lichtman
Environmental Protection Agency
Office of Radiation Programs
West Tower Gallery 1, 401 "M" Street
Washington, D.C. 20460

Dear Dr. Lichtman:

Enclosed is the only response we have received from New Mexico state agencies concerning the Draft Environmental Impact Statement for Remedial Action Standards for Inactive Uranium Processing Sites. Our office supports the proposal.

Sincerely,

Betsy Reed

Betsy Reed
Planning Bureau

BR:jeh

Enclosure

PLANNING DIVISION
(STATE CLEARINGHOUSE)
MIS-4
Review and Comment

DATE: *3-31-81*

TO: *Charles P. Wood*
Energy & Minerals Department

FROM: *Betsy Reed*
Planning Bureau

RE: *81 03 11 051* — SAI NUMBER
DEIS Remedial Action Standards for Inactive Uranium Processing Sites — PROJECT TITLE

Planning Division - Planning Bureau
LEAD AGENCY

Please review and comment on the above application and return to the sender by *April 27, 1981*

1. Does this plan duplicate any programs which have similar goals and objectives to the proposed application?
   - ___ Yes (If yes, please identify these programs.)
   - _X_ No

2. Does the proposed application conform with a comprehensive plan developed for the area in which it is located?
   - _X_ Not applicable
   - ___ Yes
   - ___ No (If no, please explain in what way it is not compatible.)

3. Does the proposed application conflict with any applicable statute, order, rule, or regulation (federal, state or local)?
   - ___ Yes (If yes, please cite the conflicting statute, order, rule or regulation.)
   - _X_ No

4. Describe any suggestions or means of improving or strengthening the proposed application.

Please see the attached comments from the New Mexico Energy and Minerals Department.

___ No interest in, or comment on, this project.
___ Proposal is supported.
_X_ Proposal is supported with recommendations.
___ Proposal is not supported.
___ Further information needed, review suspended and applicant notified of request.
_X_ Comments attached.

On the basis of my review, I have indicated my response and/or recommendations above.

Charles D. [illegible]
Signature of Reviewer

A-95 Review Coordinator
Title

4/23/81
Date

Energy and Minerals Department
Agency

Approved July, 1979
Secretary, DFA

A-257 on 215

1 - white - to applicant
1 - yellow - SPD copy

COMMENTS

DRAFT ENVIRONMENTAL IMPACT STATEMENT
For Remedial Action Standards for Inactive Uranium Processing Sites
April 22, 1981

Presented below are the comments which have been prepared by the New Mexico Energy and Minerals Department on the Draft Environmental Impact Statement for Remedial Action Standards for Inactive Uranium Processing Sites (40 CFR 192):

1. Page 2-7 (Table 2-2) -- The totals listed on Page 2-8 do not correspond to the number of "x's" in the column; in the third column, #23 and #25 (the Hite and Monticello sites, respectively) weren't designated under PL 95-604.

2. Page 2-8 (Table 2-2) -- The footnote "(d)" isn't listed in the table. What site does it refer to?

3. Page 2-19 (Reference) -- The title of Merritt's books is The Extractive Metallurgy of Uranium" -- not the title cited here (e.g. "The Extraction Metalurgy . . . ")

4. Page 3 (third line from the bottom) -- The word "unusually" should be "usually"

5. Page 3-4 (first line) -- The word "occurred" is spelled wrong.

6. Page 3-6 (second line from the bottom) -- The reference "(NU 79)" should actually be "(NR 79)", and should be listed at the end of Chapter 3.

7. Page 3-10 (footnote) -- What do the letters (GJT-13, 20 . . .) refer to? Do these references relate to specific contract reports done by Ford, Bacon, and Davis, Utah, Inc.?

8. Page 4 (second paragraph, fourth sentence) -- This sentence is not stated correctly or clearly. It should read "Uranium decays since the ore which was formed millions of years ago has built up an inventory . . . "

9. Page 5-6 (first paragraph, line 9) -- The word "coats" should be "costs"

10. Page 6-2 (last line on page) -- The word "method" is spelled wrong.

11. Page 7 (second paragraph, first sentence) -- This sentence should read: "Buildings, too, have been contaminated by tailings . . . "

Comments -- Draft Environmental Impact Statement
April 22, 1981
Page Two

12. Page 7-4 (last sentence on page) -- "Other radioactive substances in the tailings will ordinarily pose . . . radium-226."

13. Page 7-9 (second line from top) -- The word "eciding" should be "deciding"

14. Page 8-3 (line 2) — This sentence should read "may cause 40 to 90 premature deaths . . . a pile."

15. Page 8-6 (last paragraph) — The DEIS states that "such emission rates can be lowered to 2 pCi/m^2-sec for about 10 percent additional cost." The problem is this "10 percent additional cost" could translate into substantial additional costs for the State's share when the present rate of inflation and rising costs are taken into consideration. Also, this 10 percent additional cost only provides a small reduction in health effects avoided. For example, when the radon limit is set at 10 pCi/m^2-sec, 97.8 percent of the associated health effects are avoided (see Table 6-2 on Page 6-7). And when the radon limit is lowered to 2 pCi/m^2-sec, 99.6 percent of the health effects are avoided. Thus, only a 1.8 percent reduction in associated health effects is realized by lowering the limit from 10 to 2 pCi/m^2-sec. Is this small reduction in health effects worth the additional costs associated with lowering the radon limit? Will lowering the limit expose workers (directly involved with the remedial action program) to excess radiation levels?

16. Page 8-25 (under 8.2.2.1) — The third sentence states that "the level must either not be exceeded, or tailings must not be the cause of any remaining excess." Is it possible, in most cases, to determine what percentage of radon concentrations are due to tailings? The quoted sentence seems to make an assumption that isn't verified in the DEIS.

OMB Approval No. 29–R0218

FEDERAL ASSISTANCE

1. Type Of Action (Mark appropriate box)
☐ Preapplication
☒ Application DEIS
☐ Notification Of Intent (Opt.)
☐ Report Of Federal Action

2. Applicant's application
a. Number
b. Date 19 Year Month Day

3. State application identifier
a. Number 81 03 11 051
b. Date Assigned 19 81 03 18 (Year month day)

Leave Blank

4. Legal Applicant/Recipient
a. Applicant Name : U.S. Environmental Protection Agency
b. Organization Unit : Office of Radiation Programs
c. Street/P.O. Box : West Tower Gallery 1, 401 M Street
d. City : Washington
e. County :
f. State : D.C.
g. Zip Code : 20460
h. Contact Person (Name & telephone no.) : Dr. Stanley Lichtman (703) 557-8927

5. Federal Employer Identification No. N/A

6. Program (From Federal Catalog)
a. Number 6 6 • 0 0 0
b. Title Uranium Mill Tailings Radiation Control Act

7. Title and description of applicant's project
DEIS Remedial Action Standards for Inactive Uranium Processing Sites
The EPA is proposing standards for disposing of uranium mill tailings from inactive processing sites and for cleaning up contaminated open land & buildings.

8. Type of applicant/recipient
(Specify):
Enter appropriate letter B

9. Type of assistance
A–Basic Grant
B–Supplemental Grant
C–Loan
D–Insurance
E–Other
Enter appropriate letter(s) A ☐

10. Area of project impact (Names of cities, counties, states, etc.) Interstate project

11. Estimated number of persons benefiting N/A

12. Type of application
A–New
B–Renewal
C–Revision
D–Continuation
E–Augmentation
Enter appropriate letter A

13. Proposed Funding

a. Federal	$	.00
b. Applicant		.00
c. State		.00
d. Local		.00
e. Other		.00
f. Total	$	.00

14. Congressional Districts Of:
a. Applicant N/A
b. Project N/A

15. Type of change For 12c or 12e
A–Increase Dollars
B–Decrease Dollars
C–Increase Duration
D–Decrease Duration
E–Cancellation
F–Other Specify:
Enter appropriate letter(s) ☐☐☐

16. Project Start Date 19 N/A (Year month day)

17. Project Duration N/A Months

18. Estimated date to be submitted to federal agency 19 N/A (Year month date)

19. Existing federal identification number N/A

20. Federal agency to receive request (Name, city, state, zip code) EPA

21. Remarks added ☐ Yes ☐ No

Section II - Certification

22. The Applicant Certifies That
a. To the best of my knowledge and belief, data in this preapplication/application are true and correct, the document has been duly authorized by the governing body of the applicant and the applicant will comply with the attached assurances if the assistance is approved.
b. If required by OMB Circular A-95 this application was submitted, pursuant to instructions therein, to appropriate clearinghouses and all responses are attached:

		No response	Response attached
(1)	New Mexico State Clearinghouse	☐	☒ X
(2)		☐	☐
(3)		☐	☐

23. Certifying representative
a. Typed name and title
b. Signature
c. Date signed 19 (Year month day)

Section III - Federal Agency Action

24. Agency name
25. Application received 19 (Year month day)
26. Organizational Unit
27. Administrative office
28. Federal application identification
29. Address
30. Federal grant identification

31. Action taken
☐ a. Awarded
☐ b. Rejected
☐ c. Returned for amendment
☐ d. Deferred
☐ e. Withdrawn

32. Funding

a. Federal	$	.00
b. Applicant		.00
c. State		.00
d. Local		.00
e. Other		.00
f. Total	$	.00

33. Action date 19 (Year month day)
34. Starting date 19 (Year month day)
35. Contact for additional information (Name and telephone number)
36. Ending date 19 (Year month day)
37. Remarks added ☐ Yes ☐ No

38. Federal agency A–95 action
a. In taking above action, any comments received from clearinghouses were considered. If agency response is due under provisions of Part 1, OMB Circular A-95, it has been or is being made.
b. Federal Agency A-95 Official (Name and telephone number)

424-101

(ALSO PLEASE COMPLETE REVERSE SIDE)

Standard Form 424 Page 1 (10-75)
Prescribed by GSA, Federal Management Circular 74-7

PLANNING DIVISION
(STATE CLEARINGHOUSE)
REVIEW CERTIFICATION FORM

MIS 6

STATE PLANNING DIVISION
DEPT. OF FINANCE & ADMINISTRATION
505 DON GASPAR
SANTA FE, NEW MEXICO 87503
(505) 827-2073

TO: Office of Radiation Programs

DATE: 5/21/81

SUBJECT: ☐ PRELIMINARY REVIEW ☐ FINAL REVIEW ☐ STATE/AREA PLAN ☒ ENVIRONMENTAL IMPACT STATEMENT

PROJECT TITLE: DRAFT ENVIRONMENTAL IMPACT STATEMENT - REMEDIAL ACTION STANDARDS FOR INACTIVE URANIUM PROCESSING SITES

APPLICANT: Office of Radiation Programs, U.S. Environmental Protection Agency

SAI NUMBER: 81 03 11 051 FEDERAL CATALOG NUMBER: 66.000

FEDERAL AGENCY: Office of Radiation Programs, U.S. Environmental Protection Agency

PROPOSED FUNDING (PER 424 FORM)	AMOUNT
FEDERAL	$ -
APPLICANT	-
STATE	-
LOCAL	-
OTHER	-
TOTAL	-

FOR FINAL APPLICATION ONLY:

REVIEW RESULTS:

X The application is supported.
___ The application is not in conflict with State, Areawide or Local plans.
X Comments are attached for submission with this application.

LEAD AGENCY REVIEW COORDINATOR

State Planning Div.
AGENCY

TO THE APPLICANT:

You may now submit your application package, this form and all review comments to the Federal or State Agency(s) from whom action is being requested.

Please notify the Planning Division (Clearinghouse) of any changes in this project. Refer to the SAI number on ALL correspondence pertaining to this project.

STATE CLEARINGHOUSE
5/21/81
DATE

STATE PLANNING DIVISION DIRECTOR
5/21/81
DATE

2 - white
1 - to applicant
1 - for Federal Agency
1 - pink - lead agency

Approved July, 1979

A 79-25
IV-D-70 CSD

Office of Planning and Budget
Executive Department

Clark T. Stevens
Director

GEORGIA STATE CLEARINGHOUSE MEMORANDUM

TO: U. S. Environmental Protection Agency
Office of Radiation Programs
401 M Street, S.W.
Washington, D.C. 20460

FROM: Charles H. Badger, Administrator
Georgia State Clearinghouse
Office of Planning and Budget

RECEIVED
ENVIRONMENTAL PROTECTION
AGENCY
JUN 15 1981
CENTRAL DOCKET
SECTION

DATE: May 26, 1981

SUBJECT: RESULTS OF STATE LEVEL REVIEW

Applicant: Environmental Protection Agency

Project: DEIS Remedial Action Standards for Inactive Uranium Processing Sites (40 CFR192)

State Application Identifier:
GA 81-03-10-008

The State of Georgia is pleased to review the document and to see the proposed standards for disposing of tailings and for cleaning up contaminated open land and buildings. However, the State is opposed to any waste management program that may have influence on the State's groundwater system. As indicated in the Draft Environmental Impact Statement, "Uranium Mines are usually below the water table; therefore, ground water protection methods are sorely needed; at present, it's not clear if effective methods are known." This type of uncertainty could lead to opposition on the State's behalf in locating operations of this type in Georgia. The State encourages the EPA and other federal agencies to continue and take a lead role in trying to resolve the many waste dilemmas confronting our society. The State will continue to work with all concerned parties (States, Federal, local, etc.) towards improving waste management; however, the State will continue to exercise its own rights in this matter in order to maintain and protect its natural resources and the health and safety of the residents of Georgia.

CB:lb
cc Ray Siewert, DNR

Received in Radiation Office
Environmental Protection Agency
Date MAY 20 1981

CRITERIA & STANDARDS DIVISION, ORP
DATE: JUN 1 1981

A-79-25
III-D-75

COLORADO DEPARTMENT OF HEALTH

Richard D. Lamm
Governor

Frank A. Traylor, M.D.
Executive Director

June 9, 1981

RECEIVED
ENVIRONMENTAL PROTECTION
AGENCY
JUN 22 1981
CENTRAL DOCKET
SECTION

Environmental Protection Agency
Central Docket Section
West Tower Lobby
401 M Street, S.W.
Washington, D.C. 20460

Gentlemen:

Colorado has long been concerned with the disposal of uranium mill tailings. Since the early 1960's studies have been conducted with the cooperation of others to determine the impacts from inadequately stabilized tailings piles. Finally in 1972, mill tailings were recognized by Congress as having a significant potential impact. This was the passage of PL 92-314 providing for the Grand Junction Remedial Action Program on buildings where tailings were used. Continued effort by the states and EPA resulted in Congressional action in 1978 with the enactment of PL 95-604 authorizing the inactive tailings pile remedial program and providing strengthening of the NRC and Agreement State programs to preclude another generation of inadequately reclaimed and stabilized tailings piles.

Within this state there are 9 inactive uranium mill piles at 7 general locations with a total of 11 million tons of tailings. There are approximately 7,000 off-site or vicinity locations contaminated by these 9 piles. Another 16 million tons of uranium mill tailings or residues do not fall under the remedial program addressed by Title I of PL 95-604. Proposed or new mills yet to come on-line will generate an additional equivalent inventory; however they will be handled right from the start in a more fitting manner commensurate with their long-term potential hazard.

Colorado's comments are predicated on the fact that there must be consistency in the criteria and standards of EPA, NRC, DOE, and the States', and that among these entities there must be continued consistency between the regulations and interpretations implementing these standards and criteria.

Our specific comments regarding 40 CFR 192 as proposed are:

Subpart A.

192.03

a) EPA proposes a minimum of one thousand years where NRC requires a longevity standard of "thousands of years". The practicality of the matter is that the proposed EPA value would be appropriate if the protection parameters would not change over the thousand years. However, in a slight erosional environment, depending on the reclamation site, periods of thousands of years must be considered due to the pecularities and erosional potentials of the specific site. The specificity of one thousand years is as inappropriate as is the concept of using geological time. We feel that periods of 10,000 years are practical and can be economically achieved.

b) The application of drinking water standards to ground or surface waters is problematic. Values for surface waters of Colorado generally vary from 10 pCi Uranium/liter in the higher elevations to equal to or greater than 100 pCi Uranium filter in the lower reaches of major river basins. This is primarily due to the solids content of the water. In Colorado, the alpha radioactivity of these solids range from 20 to 40 pCi/gram. Radium values ranges from less than 0.1pCi/liter to over 400 pCi/liter in groundwaters. These are not man-enhanced situations. The value for radium in drinking water was based on health impact and the ability to treat elevated levels. The value for uranium was based solely on health impact. Ability to treat waters with any degree of efficiency for uranium removal is questioned. I envision extensive usage of the exemptions proposed in Part C to "accomplish" any form of remedial action thereby identifying that the standards were improperly formulated as to efficacy of attainment and enforcement.

c) If a river was within the prescribed measurement distance (0.1 kilometer), a site could have significant leaching but still be within the standard due to the dilution by the river's influence on the unconfined aquifer. The use of two different measurement distances has an economic factor, however, it is questioned if the health impact might play a more important role. Further, the criteria should be idential to that applied to active sites as the hazard is identical.

d) Vanadium, thorium 230 and lead 210 should be added to the list of parameters in Table A.

Subpart B.

192.12

a) Under (a) no guidance is provided for DOE's "reasonable assurance" in the interpretation of these standards. Additionally, there is no interpretation on how the values are to be measured. Colorado has gained a great deal of experience in the implementation of the Grand Junction program. We foresee problems in the varied interpretations that have and will occur in the future on the proper and consistent measurement procedures.

b) In respect to the radium in soil standard, the determination of adequate cleanup should be determined in conjunction with secondary measurements, i.e. scintillometer readings, rather than solely by use of multiple soil analysis.

c) Under (b) the radon standard does not state the conditions under which the 0.015WL is to be measured. Radon daughter levels are highly dependent upon the conditions in a structure during measurements. Further, the standard does not state if 0.015WL is the maximum reading, or if it is the average of several readings. The statements that it is financially practical to lower concentrations greater than 0.017WL is questionable. Our Grand Junction experience indicates that the cost per radon daughter reduction at the 0.017WL point is between $1.5 and $5 million per working level reduction. Further on a statistical basis there will be approximately twice as many false positives undergoing expensive remedial action under the 0.015WL criterion as under the 0.017 criterion (assuming there is a standardized monitoring procedure - see above).

d) Under (c) the term "dose equivalent" is used and references (a) and (b). However, the maximum dose equivalent in rem as defined is not included in Table B.

Part C.

a) The exemptions provided in 192.20 and 192.21 are consistent with the practices in Grand Junction, which relates solely to the gamma and radon daughter values. As such we envision their proper limited usage. However, with regard to the other values, as stated before, we envision extensive use of the exemptions which indicates that the standards were improperly derived.

Again, Colorado expresses concern for consistency between agencies on standards and their implementation. We might be more concerned with how DOE intends to implement these Standards. When will their implementing regulations be available for review and comment?

Attached are a letter from the Colorado Department of Health's Water Quality Control Division and an internal memo from our Grand Junction office with additional comments. Thank you for the opportunity to comment on this standard.

Sincerely,

Albert J. Hazle, Director
Radiation and Hazardous
Wastes Control Division

AJH:vb

Enclosures: as stated

COLORADO DEPARTMENT OF HEALTH

Richard D. Lamm
Governor

Frank A. Traylor M.D.
Executive Director

May 8, 1981

Environmental Protection Agency
Central Docket Section
West Tower Lobby
401 M Street SW
Washington, D.C. 20460

RE: Docket No. A-79-25 - January 9, 1981 Federal Register

Dear Gentlemen:

Colorado has several active or proposed uranium mills plus numerous inactive uranium piles. As we are an Agreement State with the NRC the Water Quality Control Division has provided technical assistance to the state licensing authority for several new and existing uranium mills.

At this time, the Colorado Attorney General interprets uranium tailings piles to be subject to control under C.R.S. 1973, 25-8-505. This section of the Water Quality Control Act addresses groundwater and requires one of two findings before the activity is permitted. The findings are: a) that no waters of the State will be polluted thereby; or b) that if waters of the State will be polluted thereby, the pollution resulting therefrom will be limited to waters in a specified limited area from which there is no risk of significant migration and the proposed activity is justified by public need. The Division has recommended finding b) above, for the one operation which has applied for a permit. Though distance and contaminant level criteria do not exist, the proposed design will provide reasonable assurance for groundwater protection. To be reasonably consistant with this Act, it is recommended that the proposed numeric limits be imposed at a distance no greater than 0.1 kilometers from either an existing pile or a relocated pile. Nondegradation should be the criteria when natural background levels exceed the numeric criteria. Part of the reason for this is the fact that, according to limited groundwater data in the 1977 Ford, Bacon and Davis Utah, Inc. reports on the inactive sites in Colorado, many of the piles have a potential for saturation during high stream flows. This being the case, it would be very possible for a pile to be impacting groundwaters yet not see the impact 1 kilometer from the site because of seepage migration into surface waters. As the placement of uranium tailings was previously based upon practicality and not good siting criteria, monitoring close to the pile will make it more difficult for a poor site to be accepted for final disposal. As saturation of the piles may be periodic, extended periods of groundwater monitoring may be required at existing sites to factually determine site adequacy for the 1000 year period.

One additional reason for imposing criteria close to a site, is the fact that most if not all the inactive piles are located in semi-arid areas. As these same areas are being impacted by great population increases and increased energy activities, the demands on the limited waters are increasing.

The chemical and radiological characteristics of seepage from a uranium pile are dependent on factors such as leaching process, ore source, soil characteristics, etc. At the Cotter mill in Canon City, molybdenum and uranium were found to be two of the most mobile metals in the groundwaters. Selenium was found to be somewhat mobile and arsenic though present in ponds, could not be found in adjacent groundwaters. The groundwaters near other sites have shown elevated levels of thorium 230 and lead 210. Due to the fact that mobility of a given parameter at a given location will indicate its value as an identifier of seepage, the proposed list of parameters plus thorium 230, lead 210 and vanadium should serve as suitable criteria. At this time, a suggested numeric limit for these three parameters cannot be made. For a given site, once the best indicators of contamination are identified, the remainder of the parameters should be of secondary importance.

One additional criteria which should be included in the standards is the location of the final disposal pile out of the floodplain of a probable maximum flood event, for any adjacent drainage. Location within such a floodplain can cuase erosion as well as saturation of portions of the pile which will not allow compliance with the 1000 year cirteria.

The primary concern of this Division is that the proposed rules would make the acceptance of existing sites as the final disposal site too simple. It is very likely that none of the existing uranium pile locations in Colorado would be acceptable for siting of a new pile. As congress has determined that proper isolation of inactive uranium piles is needed, the standards should be sufficient to insure that the uranium piles are not left at a marginal site.

One general point of concern is the indication in the Federal Register that limited groundwater impact is occurring at most sites. In review of the specific site reports of 1977 by Ford, Bacon and Davis Utah, Inc. limited data was available upon which to make any determination. If the feeling of limited impact continues, it may bias the standards before they are finalized.

Should there be any question on these comments, please contact this office.

Sincerely,

Robert J. Shukle, P.E.
Unit Chief, Industrial Unit
Permits Section
Water Quality Control Division

RJS/ky

cc: Al Hazle

COLORADO DEPARTMENT OF HEALTH
Division or Section of Radiation & Hazardous Waste Control

INTER-OFFICE COMMUNICATION

TO : Al Hazle
FROM: Hal Langner
DATE : June 2, 1981
SUBJECT: Proposed EPA Cleanup Standards for Inactive Uranium Processing Sites

The following comments are essentially the same as those made by me verbally to Stan Lichtman upon his recent visit here in Grand Junction and are hereby put in writing in accordance with your instructions for you to transmit to EPA through the appropriate channels.

The most serious criticism that I have to make is that the proposed radon daughter criterion is not a standard at all because it doesn't state the conditions under which the 0.015 WL is to be measured and that in spite of the claim in the published announcement of the proposed standards that the radon daughter criterion is "unambiguous", it is a well known characteristic of radon daughter behavior that radon daughter levels are highly dependant upon the conditions at the structure during the measurements. In other words, you don't have a standard if you don't specify the standard conditions under which the measurement is to be made.

One of the arguments used to justify the 0.015 WL criterion is that the Grand Junction program has found it to be "usually technically and financially practical to lower concentrations greater than 0.017 WL when the high working levels are due to residual radioactive materials" and that "0.017 WL is practically indistinguishable from our level of 0.015 WL". Both of these statements are highly subjective judgements and, depending on one's point of view, could both be considered to be false.

Firstly, our experience in Grand Junction (data and graph attached) indicates that the cost per radon daughter reduction at the 0.017 WL point is between about 1.5 and 5 million dollars per working level reduction. Extrapolating our data to 0.015 WL indicates an approximate cost of between about 2.3 million dollers per working level reduction and infinity.

Secondly, whereas it is difficult to distinguish 0.015 WL from 0.017 WL in an individual structure due to the high variability of the radon daughter concentration under changing conditions, on a statistical basis considering several hundreds of structures, there will be approximately twice as many false positives undergoing expensive remedial action under the 0.015 WL criterion as under the 0.017 WL criterion.

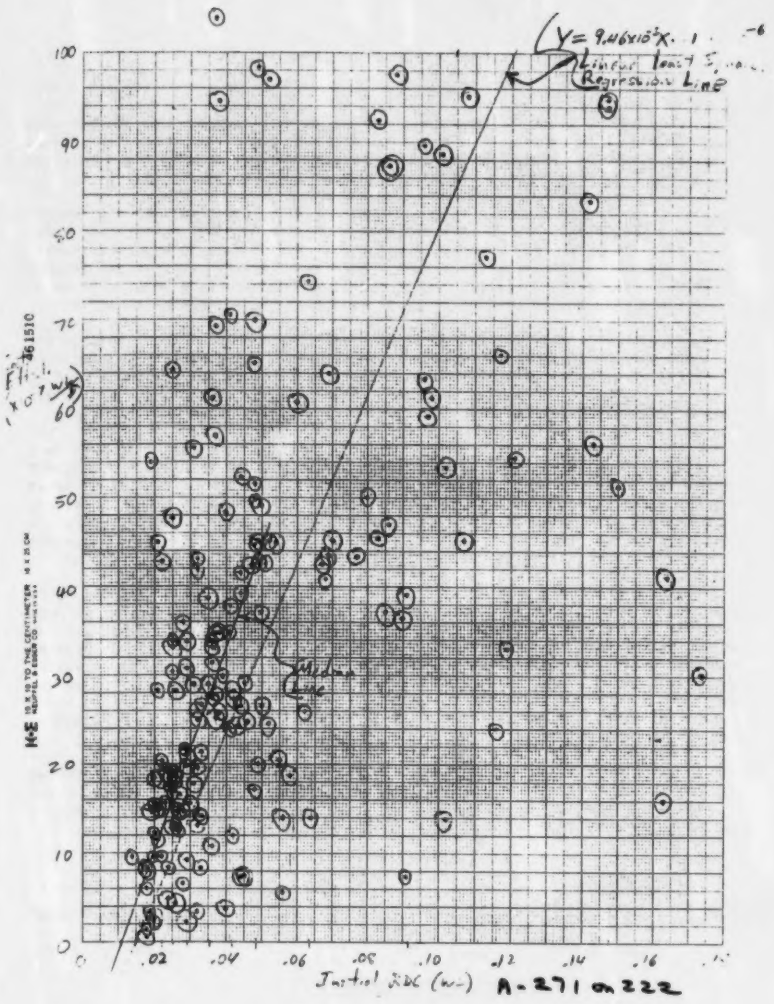
The foregoing assumes that we are talking about an average of 0.015 WL measured under some as yet unspecified set of "standardized" occupancy conditions. If instead the 0.015 WL criterion means what it appears to say, namely that the maximum concentration within the "building shall not exceed" 0.015 WL under any conditions, then nearly half of all structures with tailings associated with them that do not however have elevated radon daughter levels will

Hal
Signature

AD BUS-29 (10-29-100)

be false positives and will have to undergo expensive remedial action before it can be concluded that the radon daughter levels are not "because of residual radioactive materials".

With respect to the radium in soil standard, I have considerable concern that the way in which the standard is stated does not emphasize strongly enough that the intended objective is the use of surrogate measurements (such as scintillometer readings) to determine the adequacy of cleanup rather than, in practice, making a multitude of actual radium in soil measurements. Experience with regulatory agencies leads to the conclusion that if the guidelines can be interpreted to mean using an awkward, expensive, clumsy and inefficient way to do something, then they will often be so interpreted.



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90/01/21. 10.11.26.
PROGRAM   COSTEF

INIT.    COST       UNIT     FINAL  DOLLAR          C
 RDC   EFFECTIV     COST      RDC    COST   LOC.#  L
 .174  3.09E-06   3.24E+05   .103   22990  00001  1
 .086  4.71E-06   2.12E+05   .020   14009  00004  1
 .052  2.46E-06   4.06E+05   .033    7711  00005  1
 .022  4.28E-06   2.34E+05   .005    3975  00006  1
 .056  1.41E-06   7.11E+05   .010   32698  00012  1
 .019  8.50E-07   1.18E+06   .006   15298  00018  1
 .054  4.51E-06   2.22E+05   .016    8417  00020  1
 .031  5.56E-06   1.80E+05   .007    4315  00023  1
 .412  1.79E-05   5.59E+04   .183   12800  00030  1
 .024  1.89E-06   5.31E+05   .008    8488  00034  1
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 .048  7.00E-06   1.43E+05   .005    6140  00076  1
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 .029  9.28E-07   1.08E+06   .018   11850  00083  1
 .200  1.03E-05   9.69E+04   .005   18900  00089  7
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 .058  1.87E-06   5.34E+05   .022   19223  00095  1
 .136  1.90E-05   5.26E+04   .005    6885  00097  1
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 .022  1.86E-06   5.36E+05   .007    8047  00110  1
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 .069  4.36E-06   2.29E+05   .013   12836  00268  1
 .038  9.46E-06   1.06E+05   .007    3278  00269  1
 .047  4.24E-06   2.36E+05   .010    8722  00271  1
 .029  2.25E-07   4.44E+06   .005  106530  00273  7
 .163  1.61E-06   6.21E+05   .009   95635  00274  5
 .025  3.33E-06   3.00E+05   .007    5400  00281  1
 .091  3.93E-06   2.55E+05   .007   21396  00298  5
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 .107  4.53E-06   2.21E+05   .016   20086  00314  5
 .024  1.08E-05   9.22E+04   .006    1660  00315  1
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 .185  1.97E-05   5.08E+04   .025    8126  00344  1
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 .050  4.93E-06   2.03E+05   .016    6894  00351  1
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 .055  2.05E-06   4.88E+05   .008   22920  00399  7
 .018  5.71E-08   1.75E+07   .004  245037  00400  7
 .026  4.53E-07   2.21E+06   .004   48587  00401  7
 .020  2.81E-07   3.56E+06   .010   35572  00402  7
 .102  1.39E-06   7.19E+05   .026   54674  00403  7
 .040  3.86E-07   2.59E+06   .011   75067  00407  7
 .037  2.52E-06   3.96E+05   .010   10695  00410  1
 .190  3.26E-06   3.07E+05   .009   55604  00421  6
 .090  3.65E-06   2.74E+05   .010   21942  00424  5
 .025  4.78E-06   2.09E+05   .008    3554  00451  1
```

S-18

.023	1.56E-06	6.42E+05	.012	7064	00475	1
.024	8.43E-07	1.19E+06	.016	9490	00485	1
.621	1.62E-05	6.16E+04	.027	36563	00489	5
.029	2.15E-06	4.65E+05	.009	9308	00493	1
.147	9.41E-06	1.06E+05	.020	13500	00494	1
.031	1.78E-06	5.62E+05	.009	12357	00495	1
.049	4.51E-06	2.22E+05	.008	9082	00497	1
.150	5.14E-06	1.95E+05	.021	25093	00498	1
.032	1.32E-06	7.59E+05	.007	18968	00654	1
.083	9.25E-06	1.08E+05	.016	7247	00687	1
.142	8.35E-06	1.20E+05	.012	15560	00712	1
.102	1.12E-05	8.91E+04	.070	2850	00729	1
.032	2.50E-06	4.00E+05	.015	6808	00787	1
.060	6.08E-06	1.64E+05	.012	7895	00802	1
.097	5.93E-06	1.69E+05	.004	15683	00806	1
.020	1.56E-06	6.41E+05	.013	4490	00921	1
.087	2.75E-05	3.64E+04	.010	2800	00929	1
.030	1.57E-06	6.38E+05	.010	12750	00977	1
.027	1.50E-06	6.68E+05	.016	7347	00978	1
.123	2.26E-05	4.42E+04	.006	5173	00980	1
.164	4.12E-06	2.43E+05	.012	36865	00981	5
.029	3.07E-06	3.26E+05	.010	6190	00982	1
.018	8.18E-07	1.22E+06	.007	13448	00985	1
.069	6.40E-06	1.56E+05	.010	9225	01032	1
.088	9.77E-06	1.02E+05	.019	7063	01034	1
.064	3.70E-05	2.70E+04	.015	1324	01063	1
.034	1.27E-05	7.89E+04	.010	1893	02073	1
.038	2.56E-06	3.91E+05	.013	9780	02731	1
.033	1.42E-06	7.03E+05	.022	7731	02739	1
.101	8.87E-06	1.13E+05	.026	8460	02748	1
.035	3.87E-06	2.59E+05	.020	3879	02750	1
.103	5.60E-05	1.79E+04	.016	19421	02751	1
.102	5.35E-06	1.87E+05	.022	14965	02757	1
.083	4.55E-06	2.20E+05	.058	5493	02839	1
.032	-2.72E-07	-3.67E+06	.037	18368	02893	1
.031	2.90E-06	3.45E+05	.010	7243	03004	1
.086	8.75E-06	1.14E+05	.030	6400	03013	1
.044	2.65E-06	3.77E+05	.024	7534	03030	1
.039	3.48E-06	2.87E+05	.013	7176	03054	1
.026	2.82E-06	3.55E+05	.010	5680	03065	1
.053	1.21E-05	8.28E+04	.014	3230	03069	1
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.035	2.90E-06	3.45E+05	.012	7944	03185	1
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.033	2.14E-06	4.66E+05	.017	7463	03397	1
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.025	1.28E-06	7.83E+05	.014	8608	03505	1
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.208	5.45E-06	1.84E+05	.057	27713	03531	1
.044	1.45E-05	6.90E+04	.005	2690	03715	1
.488	2.11E-05	4.74E+04	.028	21820	03821	8
.036	3.32E-06	3.01E+05	.009	8130	03972	1
.049	4.27E-06	2.34E+05	.021	6558	04006	1
.032	1.96E-06	5.11E+05	.010	11241	04029	1
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.026	-1.13E-06	-8.89E+05	.036	8884	04048	1
.143	5.62E-06	1.78E+05	.011	23495	04065	1
.109	9.52E-06	1.05E+05	.010	10295	04093	1
.029	1.98E-06	5.06E+05	.005	12138	04094	1

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.050	2.66E-06	3.76E+05	.017	12400	04475	1
.042	2.82E-06	3.54E+05	.011	10980	04499	1
.086	8.75E-06	1.14E+05	.018	7773	04591	1
.355	3.07E-05	3.25E+04	.046	10050	04734	1
.176	1.20E-05	8.31E+04	.014	13455	04739	1
.026	1.32E-06	7.59E+05	.008	13660	04741	1
.048	1.72E-06	5.82E+05	.014	19780	04743	1
.197	6.26E-06	1.60E+05	.009	30028	04779	1
.187	1.38E-05	7.23E+04	.045	10265	04810	1
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.048	4.48E-06	2.23E+05	.020	6250	04847	1
.033	2.68E-06	3.73E+05	.009	8958	04850	1
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.194	1.38E-05	7.25E+04	.022	12464	05102	1
.036	3.14E-06	3.19E+05	.011	7972	05209	1
.202	5.46E-06	1.83E+05	.090	20528	05211	5
.210	1.41E-05	7.12E+04	.011	14160	05244	5
.062	2.60E-06	3.85E+05	.039	8844	05277	1
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.044	7.42E-07	1.35E+06	.033	14829	05390	1
.044	5.23E-06	1.91E+05	.007	7073	05461	1
.056	5.61E-07	1.78E+06	.033	40987	05548	1
.044	4.17E-06	2.40E+05	.008	8625	05604	1
.048	4.89E-06	2.05E+05	.010	7774	05606	1
.190	1.74E-05	5.73E+04	.017	9920	05648	1
.025	3.04E-06	3.29E+05	.016	2964	05664	1
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.022	2.04E-06	4.91E+05	.011	5399	05791	1
.020	1.85E-06	5.40E+05	.009	5941	05904	1
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036	3.38E-06	2.96E+05	.008	8295	05946	1
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.033	8.03E-07	1.24E+06	.028	6224	06027	1
.049	2.00E-06	5.00E+05	.013	17995	06057	1
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.045	2.93E-06	3.41E+05	.018	9200	06994	1
.113	7.72E-06	1.30E+05	.009	13471	07067	1
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.018	-1.67E-06	-6.00E+05	.020	1200	07454	1
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.036	1.04E-05	9.63E+04	.009	2600	09915	1

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.240  4.32E-06  2.31E+05  .017  51598  10517  5
.048  5.16E-06  1.94E+05  .005   8340  10607  1
.018  1.41E-07  7.08E+06  .017   7084  11029  1
.020  9.55E-07  1.05E+06  .008  12561  11538  1
.049  9.84E-06  1.02E+05  .005   4471  11827  1
.019  3.36E-07  2.98E+06  .015  11920  12244  1
.026  1.48E-06  6.74E+05  .014   8090  12290  1
.041  3.48E-06  2.87E+05  .015   7473  12496  1
.021  4.50E-06  2.22E+05  .006   3337  12497  1
.096  8.96E-06  1.12E+05  .053   4800  12538  1
.021  2.83E-06  3.54E+05  .010   3890  13103  1
.021  1.17E-06  8.54E+05  .006  12810  13201  1
.908  4.52E-05  2.21E+04  .043  19120  13325  1
.029  2.15E-06  4.66E+05  .010   8850  13358  1
.032  1.44E-06  6.96E+05  .019   9046  13380  1
.025  1.92E-06  5.20E+05  .013   6242  13382  1
.117  6.61E-06  1.51E+05  .026  13770  13590  1
.080  5.00E-06  2.00E+05  .014  13194  13683  1
.010  2.45E-07  4.09E+06  .019   4089  14136  1
.025  6.43E-06  1.55E+05  .007   2798  14378  1
.025  3.39E-06  2.95E+05  .010   4419  14640  1
.044  3.92E-06  2.55E+05  .006   9690  14920  1
.021  1.51E-06  6.64E+05  .006   9964  15084  1
.050  3.72E-06  2.69E+05  .024   6993  15415  1
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.022  9.70E-07  1.03E+06  .018   4122  15647  1

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A-79-25
IV-D-76

NEW YORK STATE ENERGY OFFICE

NEW YORK
STATE ENERGY OFFICE
ROCKEFELLER PLAZA
ALBANY, NEW YORK 12223
JAMES L. LAROCCA, COMMISSIONER

June 15, 1981

RECEIVED
ENVIRONMENTAL PROTECTION
AGENCY
JUN 24 1981
CENTRAL DOCKET
SECTION

U.S. Environmental Protection Agency
Central Docket Section
Docket No. A-79-25
West Tower Lobby
401 M Street, S.W.
Washington, D.C. 20461

Dear Sirs:

The U.S. EPA's proposed disposal standards for inactive uranium processing sites (46 FR 2556, January 9, 1981) have been reviewed by the cognizant New York State agencies. In this regard, enclosed for your consideration are comments developed and submitted to this Office by the New York State Department of Environmental Conservation.

New York appreciates being given the opportunity to comment on this proposed regulatory action.

Sincerely,

Jay D. Dunkleberger, Director
Bureau of Nuclear Operations

JDD/JM:cjm

COMMENT ON THE U.S. ENVIRONMENTAL PROTECTION AGENCY PROPOSED CLEANUP AND DISPOSAL STANDARDS FOR INACTIVE PROCESSING SITES

Although the EPA proposed standards are intended to protect the public from the radiological consequences of exposure to uranium mill tailings, and in particular the radon gas emanating from the tailings, the lack of standards for other radium bearing materials such as iron mill tailings, coal ash and phosphate slags, will almost certainly lead to broader application. To minimize difficulties in application to these other materials, the standard should consider and incorporate a radon emanation coefficient.

Radon emanation is the ratio of the rate of escape of radon-222 to the rate of production from radium-226, usually expressed as a percent. It is a measure of the self-sealing effect of the material itself. Crushed igneous or metaphoric rocks usually have radon emanations below 1%. The chemical solution of uranium and separation from the radium and thorium reduces the self-sealing effect of the crushed uranium ore. Uranium mill tailings typically have a radon emanation around 20%.

An example of how the standard might be applied to other materials will help to illustrate the point. A sample of iron mill tailings, rock crushed to sand, contained a radium-226 concentration of 30 picocuries/gram and a radon emanation factor of 0.5%. This can be equated to uranium mill tailings via the following formula:

$$\text{Radium-226 Concentration} \times \frac{\text{Radon Emanation Coefficient}}{\text{Radon Emanation Coefficient for Uranium Mill Tailings (i.e., 20)}} = \text{Radium Concentration Equivalent of Uranium Mill Tailing}$$

In this specific example:

$$\frac{30\ \text{pCi/gm} \times 0.5}{20} = 0.75\ \text{pCi/gm Uranium Mill Tailing Equivalent}$$

From the perspective of radon emanation, the 30 pCi/gm radium-226 concentration iron mill tailings would be less hazardous than the 5 pCi/gm limit on uranium mill tailings by factor of 6.7.

EPA should consider the addition of the following or comparable provisions to its regulations:

DEFINITIONS: (g) RADON EMANATION COEFFICIENT of a material means the ratio of the rate of release of radon-222 gas from the material to the rate of production of radon-222 gas from the radium-226 contained in the material. This coefficient can be estimated by measuring the ratio of radon-222 gas that collects in a sealed container holding a representative sample of the material, after the equilibrium has been reached (i.e., about 15 days), to the activity of radium-226 contained in the sample.

STANDARDS: The average concentration of radium-226... shall not exceed 5 pCi/gm for a radon emanation of 10% or above. For radon emanation below 10% the concentration of radium-226 shall not exceed 5 pCi/gm multiplied by the ratio of 10 to the radon emanation for that material.

BRUCE KING
GOVERNOR

STATE OF NEW MEXICO
GOVERNOR'S CABINET
SANTA FE
87503

GEORGE S. GOLDSTEIN, Ph.D.
SECRETARY FOR HEALTH & ENVIRONMENT

S Lichtman
A-79-25
IV-D-79

June 15, 1981

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ENVIRONMENTAL PROTECTION
AGENCY
JUN 26 1981
CENTRAL DOCKET
SECTION

Mr. David M. Rosenbaum
Deputy Assistant Administrator
for Radiation Program
U.S. Environmental Protection Agency
Washington, D.C. 20460

Dear Mr. Rosenbaum: David

Thank you for your letter of January 29, 1981 concerning Proposed Disposal Standards for Inactive Uranium Processing Sites to me and to the Governor. The Governor responded to you on March 27, 1981.

The staff has reviewed extensively the proposed standards and the rationale used in determining the numbers. Also, a member of my Department attended public hearings at Durango, Colorado on April 27, 1981 on this subject.

Paragraph 192.03(a) on page 2562 of the Federal Register, Volume 46, No. 6 states the proposed standard of 2 pCi/m^2-sec for radon emission from a disposal site. Immediately below is a "Note" in small print that allows the radon emissions from the covering materials to be estimated as part of the disposal plan for each site and added to the 2 pCi/m^2-sec standard to determine the specific standard to be met for that site. If the covering material is obtained from the near vicinity of the pile, but uncontaminated from the pile, then the radon flux should be similar to the background rate for the area. Generally speaking the allowable standard would be background plus 2 pCi/m^2-sec. Therefore, we recommend that the "Note" format be changed to full print and covered in paragraph 192.03(a). We do not wish to comment on the adequacy of the 2 pCi/m^2-sec standard at this time as the status of this standard is under litigation by the Federal Courts, and under review in our New Mexico public hearing process.

The standard of 5 pCi/gm for Radium-226 is soil in paragraph 192.12(a) pertains primarily to off-site radiation attributable to radioactive materials from a tailings site. The high natural background found in some areas of New Mexico may exceed this standard. This could be a potential problem for future remedial work. However, the Criteria for exceptions found in paragraph 192.20 provides a reasonable approach applicable to these situations.

The Nuclear Regulatory Commission in 10 CFR 20, Appendix B of paragraph 20.601 lists the maximum permissible concentration for uranium in water to unrestricted areas as 3 x 10^{-5} μCi/ml or 30,000 pCi/liter. Table A of Part 192 of your Federal Register announcement shows 10 pCi/liter as the maximum permissible concentrations for uranium in water. These figures are grossly inconsistent. The New Mexico Water Quality Control Commission Regulations list standards of 5.0 mg/liter for uranium based on chemical toxicity.

Table A of Part 192 does not list thorium or radioactive lead and 10 CFR 20.601, Appendix B lists Thorium-230 as being more restrictive by a factor of 10 than uranium and Lead-210 as being more restrictive by a factor of 100. This is inconsistent with the statement concerning most hazardous tailing substances in the last paragraph on page 2559 of your Federal Register notice.

The Nuclear Regulatory Commission in October 1980 published final rules for Uranium Mill Licensing Requirements, 10 CFR Parts, 30, 40, 70 and 150. Appendix A to Part 40 requires that licensees place sufficient earth cover, but not less than 3 meters, over tailings to insure stability and reduce radon exhalation at the end of milling operations. The EPA has not required the 3 meter cover in its regulations for Inactive Uranium Sites under Title I of PL-95-604. This department agrees with this omission. The depth of cover should be a site specific determination and pertain to erosional considerations and ability to isolate tailings as well as radiological conditions.

Paragraph 2 of Radiation Effects from Air Pathways on page 2558 of your Federal Register notice states "that individuals" living continuously one mile from a large pile would have about 200 times as great a chance of fatal lung cancer caused by radon decay products as persons living 20 miles away (7 in 10,000 versus 3 in 1,000,000)". Actual measurements of piles in New Mexico by the Environmental Improvement Division indicate that radon levels drop almost to background levels at about one-half mile. The radon levels at 1 mile and 20 miles are indistinguishable from background. Similiar measurements are reported by Ford, Bacon and Davis Utah, Inc., in their assessments for the Department of Energy of ours and other states' piles, particularly the Salt Lake City Vitro pile. Also, at the International Conference of Nuclear Power and Its Fuel Cycle held in Salzburg, Austria, May 2 through 13, 1977, scientists from the Energy, Research and Development Agency and Oak Ridge National Laboratory presented information as follows "That for those residing continuously within one-half mile of the tailings the risk of lung cancer incidence is about double that for the general population". This statement refers to the Vitro Site, Salt Lake City, Utah. The statement in paragraph 2 is inconsistent with information reported in other technical documents.

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Mr. David M. Rosenbaum
June 15, 1981
Page -3-

I appreciate your extending the comment period to June 15, 1981 since this allowed the staff to attend other important meetings and hearings which have a direct bearing on this matter.

Sincerely,

George S. Goldstein, Ph.D.
Secretary

GSG:tcb

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Department of Energy
Washington, D.C. 20585

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RECEIVED
ENVIRONMENTAL PROTECTION
AGENCY
JUN 1 9 1980
CENTRAL DOCKET
SECTION

Mr. Douglas M. Costle
Administrator
Environmental Protection Agency
401 M Street, S.W.
Washington, D.C. 20460

Dear Mr. Costle:

This letter covers the Department's comment on the CLEANUP STANDARDS FOR INACTIVE URANIUM PROCESSING SITES for open lands and buildings, developed by the Environmental Protection Agency in accordance with Public Law 95-604, the Uranium Mill Tailings Radiation Control Act of 1978, and published in the Federal Register on April 22, 1980. Prior to publication, we supported the concept of interim standards to permit timely remedial action at high priority properties in the vicinity of the designated sites, but we did not support the targeted values for the standards. Departmental staff has consistently stated in discussions with Agency staff, and I stressed in my letter of April 14, 1980 to Mr. David Hawkins (copy enclosed), that our field experience indicates that implementation and certification based on the proposed standards will be very difficult. Our position remains that the intent of the Act can be met by more flexible standards without in any way sacrificing the degree of radiation protection provided to the public. Our specific comments relating to the problems of implementing remedial actions and of certifying that the standards are met under the highly diverse conditions known to exist at the hundreds of vicinity properties involved follow.

Radon Decay Product Concentration Standard

The Department recommends that the proposed single limit of 0.015 working levels for average annual indoor radon decay product concentration, including background, be replaced with graded action levels paralleling those used in the remedial action program at Grand Junction, Colorado. The proposed limit of 0.015 working levels is less than that which exists in a significant fraction of homes across the country. About 32 percent of the more than 350 structures from which all apparent mill tailings were thought to have been removed in the Grand Junction program still exceed 0.015 working levels. Thus, we feel that in many cases to be encountered in the mill tailings program it will be difficult to certify that all apparent mill tailings have been removed from the immediate vicinity of a structure or otherwise prevented from affecting the radon decay product concentration in the structure's interior.

The Supplementary Information included in the Federal Register notice with the standards appears to provide some flexibility by indicating that if all apparent tailings have been removed, the remedial action can be considered completed regardless of the working level. Because the proposed working level limit is very close to background at many of the Western sites, it will be difficult and costly to determine the cause of slightly exceeded working levels. Material may have to be unnecessarily removed from under floors and foundations in an attempt to demonstrate that no apparent tailings are present. There may also be cases where structures are in the proximity of the processing site and there is no way to be certain whether the working level standard is being exceeded because of tailings on the property or because of radon emissions from the site. Because there would be no information on the radiological conditions before tailings were moved to the property, a judgement concerning whether or not the property contains tailings would have to await completion of remedial action at the processing site.

When the working level limit is only slightly exceeded, the Criteria for Exceptions allows for an exception to be requested if the cost of removing additional material is felt to be unreasonably high relative to the benefits. The alternatives would be to proceed with the removal of additional material with the hope that after a year the property could be certified or to become involved in an undefined exceptions procedure that could turn out to be complicated, cumbersome, time consuming, and costly. In any case the individual owner would suffer because the status of his property would be uncertain for an indeterminate length of time.

We are also concerned about the implications of potentially large numbers of exceptions. For example, if exceptions are requested on a significant percentage of properties in the vicinity of a site, the program could become so enmeshed in a formal exceptions procedure that public confidence could easily be lost. Exceptions should be for "exceptional" circumstances--not common situations.

There is little question that these difficulties could be avoided without any significant loss of benefits. The Department urges therefore that flexibility be provided in the standards by making 0.03 working levels as an upper limit so long as it is the lowest that can be reasonably achieved. Of course the goal would always be 0.015 working levels or less.

Contaminated Soil Standard

The layer specifications for contaminated soils on open lands still present a grave concern. The concern is that it does not appear possible to detect the specified layers of materials contaminated with five picocuries of radium per gram with field instruments, and that it will be necessary to resort to the collection, cataloging, and analysis of many thousands of laboratory samples in order to meet the requirements of the standard as now written. As a consequence, it will be necessary to either undertake a long and costly measurement development program with no assurance of success or to encounter high costs and delays for analyzing large numbers of soil samples. Because the soil specification is not,

in itself, directly and immediately related to public health and safety, I recommend that further study be undertaken to develop an alternative soil standard that can be readily measured with existing or easily adaptable field instrumentation and will provide adequate protection of public health. My staff will be pleased to participate in the study, which should also include other radiological survey and instrumentation experts.

I very much hope you will be able to resolve these issues, which are so important to the successful implementation of Public Law 95-604, before final standards are promulgated.

Sincerely,

Signed by Ruth C. Clusen

Ruth C. Clusen
Assistant Secretary for Environment

Enclosure

cc w/encl:
Docket No. A-69-25
Environmental Protection Agency
Central Docket Section
Room 2903 B
401 M Street, S.W.
Washington, D.C. 20460

F-1

APR 1 4 1980

Mr. David Hawkins
Assistant Administrator for
  Air, Noise and Radiation
U.S. Environmental Protection Agency
201 M Street, SW
Washington, DC 20460

Dear Mr. Hawkins:

This confirms our telephone conversation on April 4, 1980, about the publication of standards for the Uranium Mill Tailings Program. While it is true that some of my previous concerns have been alleviated in the draft which you provided on March 28, 1980, we still have two major concerns:

1. The 0.015 WL limit on indoor radon daughter concentration is too low since it is less than that which exists in a significant fraction of homes across the country not associated with tailings. There is no reason to believe that this limit can be met after remedial actions since in Grand Junction, 32 percent of the structures exceed that limit after remedial actions have been taken. We agree that 0.015 WL is a reasonable target criterion or goal, but it is unreasonable to establish it as a firm limit. We believe that 0.03 WL is a more reasonable upper limit. The criteria which you proposed for exceptions could then be used to establish the point at which remedial action would be considered complete.

2. The layer specifications for contaminated soils still presents a grave concern. The staff advises me that we cannot demonstrate compliance with this requirement without undertaking a very long and costly measurement program. Since this specification is not, in itself, directly related to public health and safety, I suggest that our staffs meet with experts in soil monitoring to develop a reasonable alternate soil standard that can be readily measured with existing field instrumentation.

Interim standards will permit us to move forward toward remedial actions at high priority locations. However, I do not support the publishing of the

F-1

proposed standards. We are, of course, concerned as you are about the protection of the public from exposure to radon and its daughters. However, to accomplish this, we must assure that the standards can be effectively implemented.

Sincerely,

Ruth C. Clusen
Assistant Secretary for Environment

TENNESSEE VALLEY AUTHORITY
NORRIS, TENNESSEE 37828

AUG 27 1980

Docket No. A-79-25
U.S. Environmental Protection Agency
Central Docket Section, Room 2902
401 M Street, SW
Washington, D.C. 20460

We are pleased to provide comments on the interim and proposed environmental standards for the cleanup of open lands and buildings contaminated with residual radioactive materials from inactive uranium processing sites. These standards, designated as 40 CFR Part 192, Subparts B and C, were published in the April 22, 1980, Federal Register (45 FR 27366-27368 and 45 FR 27370-27375). Our comments are provided as an enclosure.

Copies of the draft environmental impact statement (DEIS) were requested from Dr. Stanley Lichtman by my letter dated June 3, 1980. We anticipate that additional comments will be forthcoming after review of the DEIS.

We appreciate the opportunity to comment on these standards.

Sincerely,

for Mohamed T. El-Ashry, Ph.D.
Director of Environmental Quality

Enclosure

RECEIVED
ENVIRONMENTAL PROTECTION AGENCY
SEP
CENTRAL DOCKET
SECTION

ENCLOSURE

TENNESSEE VALLEY AUTHORITY COMMENTS ON THE U.S. ENVIRONMENTAL PROTECTION AGENCY'S INTERIM AND PROPOSED STANDARDS FOR INACTIVE URANIUM PROCESSING SITES (45 FR 27366-27369 AND 45 FR 27370-27375), 40 CFR PART 192, SUBPARTS B and C

1. The standards require remedial action for structures where measurements exceed 0.015 WL for the average annual indoor radon decay product concentration, including background. This is inconsistent with EPA's recommendations with respect to Florida phosphate lands, remedial actions taken at Grand Junction, Colorado, and present criteria applied at Edgemont, South Dakota, by the Department of Housing and Urban Development. The reason for this lower limit is not stated. The health risks associated with radon levels of this low magnitude have not been documented, but rather, as in the phosphate land studies, available data on miners has been extrapolated to the general public. Cumulative doses and dose rates among members of the general public are significantly different from those doses and dose rates among miners and will be received under different conditions. Thus, we do not believe that a limit of 0.015 WL can be technically justified.

   Also, EPA recognizes that "background" levels in many homes may normally exceed 0.015 WL notwithstanding the lack of presence of tailings material. While EPA predicts some 10 percent of all structures may fall within this category, sufficient data exists to indicate that this estimate understates the true percentage. As a result, unless remedial measures are recommended based upon a careful determination of the presence of tailings, remedial action will be taken on many structures not affected by tailings. Moreover, in requiring remedial action in structures at this low level, EPA is in effect (and without basis) declaring many homes throughout the country that are not near inactive processing sites to be unsafe. This is an impact with far-reaching economic, legal, and psychological consequences. Additionally, in light of the interagency task force study of indoor radon effects recently undertaken, it is premature to set such levels on a permanent basis. Therefore, we believe that it is important to determine site-specific background levels in order to evaluate the contribution of tailings to any levels recorded and set reasonable goals for remedial action based upon a better evaluation of health effects from such contribution.

2. Throughout the proposed and interim standards, there are references to analyses and test procedures which need clarification. For instance, we are unaware of any approved discrete sampling method(s) to provide reasonable assurance that there is not in excess of 5pCi/g of radium-226 in any designated soil thickness. Also, examples of "search and verification procedures which provide a reasonable assurance of compliance with the standards" while retaining "flexibility" for the implementers, as discussed in the implementation discussion of the supplementary information, should be given. Additional guidance regarding acceptable implementing procedures for other necessary surveys is also needed.

Also, the method of determining compliance with Section 192.12(c) is not clear. This is especially true because it is stated (on page 27373, second column, second paragraph) that "the environmental pathways and biological effects of some" other radionuclides "are not as well known as for radium-226."

3. The basis should be given for the correlation between the specified limits of 0.015 WL for the average annual indoor radon decay product concentration, including background, and 0.02 mR/hour for the indoor gamma radiation above background (see Section 192.12(b) and Table B).

4. Page 27366, Supplementary Information, second paragraph, second sentence - The definition of "open land" given by Section 192.11(c) excludes surface and subsurface land which is a disposal site or is covered by a building. Therefore, we believe it is incorrect to state that "the greatest hazard from tailings on open lands is increased levels of radon decay products in buildings." It should be clarified that the hazard is derived from the use of tailings as building materials.

5. Page 27371, Tables 1(A) and 1(B), footnote 3 - For estimating relative risk, the value "G3" appears to be a typographical error for "365."

6. Page 27373, column 2, second paragraph - It is not clear who will perform and fund the "further evaluation of the hazard pathways" to determine "the degree to which any site would need to be cleaned up."

7. Section 192.20(a) - The criteria for qualifying for an exception under Subpart A of 40 CFR Part 192 is unknown since Subpart A is currently labeled as being reserved. We believe that Subpart A should be prepared and issued for comments to facilitate the review of the entire regulation.

A-79-25
IV-D-16

Department of Energy
Washington, D.C. 20585

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RECEIVED
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JAN 08 1981
CENTRAL DOCKET
SECTION

Dr. David M. Rosenbaum
Deputy Assistant Administrator
for Radiation Programs (ANR-458)
U.S. Environmental Protection Agency
Washington, D.C. 20460

Dear Dr. Rosenbaum:

This is the Department of Energy's response to your request for comments on the draft Federal Register notice, "Proposed Disposal Standards for Inactive Uranium Processing Sites" (August 25, 1980), and the Draft Environmental Impact Statement, "Remedial Action Standards for Inactive Uranium Processing Sites" (August 25, 1980). These documents do not alleviate any of the Department's serious concerns related to implementing and certifying the proposed remedial action and disposal standards, which were explained in my letters of June 13, 1980 to Mr. Douglas M. Costle, of March 7, 1980 to you, and of February 15, 1980 to Mr. David Hawkins.

The language in the standards implies that "reasonable expectation" and "reasonable assurance" will be provided to substantiate that the numerical values of physical and chemical quantities are nowhere exceeded after remedial action. The Department's experience indicates that unqualified numerical values could be interpreted by many to be absolute limits. Consequently, the numerical values that we have to achieve might have to be lower than the standards so that the unavoidable inaccuracies in the measurement, and in the survey and sampling procedures will not cause final conditions to exceed the standards.

These difficulties can be avoided with no loss of health benefits if, in addition to the statements regarding reasonable expectation and assurance, the numerical values for physical and chemical quantities in the standards are qualified as goals to be achieved within the accuracy of available field and laboratory instrumentation used in conjunction with reasonable survey and sampling procedures.

If you have any difficulty in accepting the proposed recommendations and incorporating them into the proposed standards, please contact Dr. William E. Mott of my staff so that a meeting can be arranged.

Sincerely,

Ruth C. Clusen
Assistant Secretary for Environment

cc: Mr. David Hawkins, EPA
Mr. Douglas Costle, EPA

F-4

A-79-25
II-D-19

FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON 20426

IN REPLY REFER TO:

February 26, 1981

RECEIVED
ENVIRONMENTAL PROTECTION AGENCY
MAR 17 1981
CENTRAL DOCKET SECTION

Mr. William A. Mills, Ph.D.
Director, Criteria & Standards Div.
Office of Radiation Programs
U. S. Environmental Protection Agency
Washington, D. C. 20460

Dear Mr. Mills:

I am replying to your request to the Federal Energy Regulatory Commission for comments on the Draft Environmental Impact Statement for Remedial Action Standards for Inactive Uranium Processing Sites (40 CFR 192). This Draft EIS has been reviewed by appropriate FERC staff components upon whose evaluation this response is based.

This staff concentrates its review of other agencies' environmental impact statements basically on those areas of the electric power, natural gas, and oil pipeline industries for which the Commission has jurisdiction by law, or where staff has special expertise in evaluating environmental impacts involved with the proposed action. It does not appear that there would be any significant impacts in these areas of concern nor serious conflicts with this agency's responsibilities should this action be undertaken.

Thank you for the opportunity to review this statement.

Sincerely,

Jack M. Heinemann
Advisor on Environmental Quality

RECEIVED
CRITERIA & STANDARDS DIVISION, ORP
DATE: MAR 4 1981

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A-79-25
IV-D-47

United States
Department of
Agriculture

Soil
Conservation
Service

P.O. Box 2890
Washington, D.C.
20013

April 1, 1981

Dr. William A. Mills
Director, Criteria and Standards Division (ANR-460)
Office of Radiation Programs
Environmental Protection Agency
Docket No. A-79-25
West Tower Gallery 1
401 M Street, S.W.
Washington, D.C. 20460

Dear Dr. Mills:

The Draft Environmental Impact Statement for Remedial Action Standards for Inactive Uranium Processing Sites has been reviewed by the Soil Conservation Service (SCS). We find the proposed action is not in conflict with any SCS program or project.

Thank you for providing us with the opportunity to review the draft.

Sincerely,

Thomas N. Shiflet
THOMAS N. SHIFLET
Director of Ecological Sciences

The Soil Conservation Service
is an agency of the
Department of Agriculture

RECEIVED
CRITERIA & STANDARDS DIVISION, ORP
DATE: APR 8 1981

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A-79-25
IV-D-37

United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

ER 81/75

APR 30 1981

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ENVIRONMENTAL PROTECTION AGENCY
MAY 06 1981
CENTRAL DOCKET SECTION

Environmental Protection Agency
Central Docket Section
West Tower Lobby
401 M Street, S.W.
Washington, D.C. 20460

Dear Sir:

We have reviewed the proposed Disposal Standards for Inactive Uranium Processing Sites, published in the Federal Register January 9, 1981 and have the following comments and suggestions for your consideration.

We are concerned that the proposed reclamation longevity standard of at least 1,000 years be kept in proper perspective--a criteria for minimal acceptability with far greater stability desired where feasible. While the desirability of a longer period of stability is recognized in the supplementary information, the proposed regulations contain no word as to a possible requirement for a longer period of protection. Instead, the criteria in Subpart C all concern instances where the standards need not be attained. These seem focused entirely on costs of reclamation with no consideration of public health and safety or resources at risk. Even though any alternate longevity standardswould still be arbitrary, it would be desirable to specify the site conditions under which the proposed longevity standard would not be sufficient. Among these should be sites on flood plains and drainage courses, where the probability of erosion and exposure in the long term would remain high in spite of remedial action.

It is stated that the longevity standard of 1,000 years was chosen because adequate methods for demonstrating compliance for longer periods are not clearly available and may be very costly (p. 2560, col. 3, par. 4). The methods for demonstrating compliance are intended to be analyses using "computational models, theories, and expert judgment" as the major tools (p. 2561, col. 1, par. 2). It is not clear that these tools, when used to evaluate the effects of natural erosive forces on materials disposed near the earth's surface, need be limited to 1,000 years. Uncertainty in the analyses may indeed grow as the time period is extended and as

additional factors have to be included in the evaluation. However, uncertainty is not absent even though analyses are limited to the 1,000-year standard. In fact, the shorter the period evaluated, the greater will be the uncertainty over the efficacy of the remedial action for very long times. For example, it appears to be quite likely that the intended tools of analysis can provide reasonable expectation that the proposed radon standard will be met for at least 1,000 years at a particular pile, as well as reasonable expectation that within 10,000 years that pile will be uncovered again. In this case it appears clear that the 1,000-year standard is not an adequate frame of reference.

It is probably not hydrologically practical to specify non-degradation or no releases from tailings piles. Such a requirement would mean that the tailings must be emplaced completely dried and completely sealed forever against the entrance of water.

We suggest that EPA also consider whether or not restrictions should be placed on land use options and ground water uses within an appropriate distance from the tailings piles. Since proposed ground water standards are to be measured at one kilometer from existing piles, it would seem appropriate to have a similar standard to warn people of inherent dangers on land use and ground water at least within the one kilometer distance.

Sincerely,

CECIL S. HOFFMANN
Special Assistant to
Assistant SECRETARY

A-79-25
IV-D-40

United States Department of the Interior
OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

ER 81/251

APR 30 1981

Environmental Protection Agency
West Tower Gallery 1
401 M Street, S.W.
Washington, D.C. 20460

RECEIVED
ENVIRONMENTAL PROTECTION
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MAY [illegible] 1981
CENTRAL DOCKET
SECTION

Dear Sir:

We have reviewed the draft environmental statement for Remedial Action Standards for Inactive Uranium Processing Sites and have the following comments and suggestions for your consideration.

It is stated that the longevity standard of 1,000 years was chosen because methods for demonstrating compliance for longer periods are clearly not available and may be very costly (p. 8-22, par. 1). The methods for demonstrating compliance are intended to be analyses using "computational models, theories, and expert judgment" as the major tools (p. 9-1, par. 2). A clear case that the reasonable assurance these tools provide is limited to 1,000 years is not made. Mention is made of climate, vegetation, and tectonic changes that can affect tailings near the surface when longer time periods are considered (p. 8-20, para. 4); however, these factors must also be considered for the 1,000-year period. Uncertainty in the analysis may grow as the period is extended, but uncertainty is not absent in the 1,000-year period, and it is not clear that the intended tools of analysis dictate the proposed longevity standard. For example, it appears quite likely that at some tailings piles the tools of analysis can provide reasonable expectation that the remedial action can meet the proposed standards for 1,000 years, and equally reasonable expectation that within several thousand years the pile will be uncovered again. If the longevity standard needs to be limited, it should be made clear that it is not because of lack of, or cost of, the methods for demonstrating compliance.

Longer periods of protection are stated to be likely to be required by implementors at some piles (p. 8-22, para. 2). However, this is not reflected in the proposed regulation, where we found no word of the possible requirement for longer periods of protection. Instead the criteria for exceptions to the proposed standards appear to concern cases where the standard cannot or need not be attained (app. D, p. 8-9).

We note that existing ground water contamination from tailings is not to be covered by the standards (p. 5-6, para. 3). However, the statement should review the scope of such existing problems and assess the impacts of the exclusion of existing tailings-related ground water contamination from the cleanup of a site. The assessment should include an evaluation of the potential for impacts on the public via the contaminated ground water, including the possibility of future use of the decontaminated open land and buildings or of the surrounding area.

Seepage of contaminants from some tailings ponds has been reported as being of considerable magnitude. In some locations this has occurred under high water-table conditions; however, other studies have indicated that even in dry climates precipitation can produce a downward flow of water through tailings (p. 3-1, 3-4, 3-5, 3-6, 3-9). In most cases the contaminated ground water will continue to move downgradient. Thus the statement should evaluate the impacts of the exclusion from the proposed environmental standards of contaminated ground water within a radius of 1.0 kilometer from a disposal site that is part of an inactive processing site (app. D: p. 4). The expectation that other Federal agencies can be counted upon to take practical actions at sites where they are needed to avoid harm from contaminants already released from the tailings (p. S-6) suggests possible overlaps in administration which might result in delayed solution of ground water problems. Impacts of such an eventuality should be included in the assessment.

The statement should address the possibility that in some environments radon may be released upon withdrawal of potable ground water affected by the tailings (p. S-2). This possibility should be evaluated, because the radon, where present in domestic water supplies, would commonly be released indoors where it could be inhaled.

The naturally occurring emission rates, with a clearly stated range of variation, should be included. The typical rate is given as 0.5 to 1.0 pCi/m^2-s, with variations "...to several times these values not unusual." (p. 8-4). Several times the high typical rate results in a value of 3.0 pCi/m^2-s as being not unusual. This is above the standard proposed (2.0 pCi/m^2-s) and requires additional explanation. If 3.0 pCi/m^2-s is not unusual, justification for a lower standard may be difficult.

Setting the proposed remedial action level at 0.015 WL for occupied or occupiable buildings seems excessive when: (1) 10 percent of normal homes with basements naturally exceed this level, and (2) 0.017 WL was the action level used at Grand Junction. Under the proposed action level, it is possible that additional action would have to be carried out in Grand Junction on properties cleared or treated earlier (pp. 8-27, 28).

We appreciate the opportunity to review and comment on this program.

Sincerely,

CECIL S. HOFFMANN
Special Assistant to
Assistant SECRETARY

DEPARTMENT OF HEALTH & HUMAN SERVICES
Public Health Service

Centers for Disease Control
Atlanta, Georgia 30333
(404) 262-6649

A-79-25
III-D-58

May 6, 1981

Environmental Protection Agency
Docket No. A-79-25
Central Docket Section
West Tower Lobby
401 M Street, S.W.
Washington, D.C. 20460

RECEIVED
ENVIRONMENTAL PROTECTION
AGENCY
JUN 11 1981
CENTRAL DOCKET
SECTION

Dear Sir/Madam:

Thank you for sending us your solicitation for comments on the Proposed Standards (40 CFR-Part 192) for the cleanup and disposal of residual radioactive materials (mainly tailings) from inactive uranium processing sites. We have reviewed both the Proposed and Interim Cleanup Stnadards (Federal Register, April 22, 1980), and the Proposed Disposal Standards for tailing piles (Federal Register, January 9, 1981). We are responding on behalf of the U.S. Public Health Service and are offering the following comments for your consideration in preparing the final standards.

Proposed and Interim Cleanup Standards

We have some concern with the first sentence on page 27373, "If the allowable level is still exceeded after all apparent tailings have been removed or otherwise prevented from affecting the interior of the building, then the standard does not require further remedial measures." This sentence should be revised because it seems to provide a loophole through which someone could decide to end remedial measures when tailings were no longer apparent or could not be prevented from affecting the interior of a building. We do not believe that remedial measures should be terminated when an occupant's exposure to radon decay product concentrations from tailings is still considered hazardous to health. As a last resort, it may be the exposure that has to be eliminated by moving and compensating the affected occupants and/or owners.

Proposed Disposal Standards

The introduction (page 2556) reads as though the cleanup process actually ". . .reduces the potential health consequences of tailings. . . ." Instead of this wording, we recommend that the paragraph be rephrased to indicate that cleanup process really reduces "public health exposure" which could, consequently, result in a reduction of potential health problems. In the references to the introduction, you may wish to update the reference on The Effects of Exposure to Low Levels of Ionizing Radiation (1972) to the 1980 Bier 3 Report.

Since the air-transmitted hazards associated with radon decay products from uranium mill tailings are the most significant in terms of public health risks, disposal standards should consider other types of protection standards in addition to allowable emission rates. While covering the tailings with soils and clay may be a feasible method for controlling radon emissions to 2pCi/m^{2}sec, disturbance of this cover in the future would negate any of its benefits. One protection standard that should be considered is the imposition of deed restrictions on the use of the land and/or disturbance of the cover in the future. These restrictions are important because construction of any ditches, pipelines, and structures on these sites in the future could expose tailing and radon decay products.

Did the data used for calculations in Items 2 and 4 (page 2558) take smoking into account? If this were ignored, smoking could actually increase the risk following radiation exposure.

Was any consideration given to the potential health problems occurring in populations exposed along the transport route if moving a mill tailings pile is necessary?

The possibility of biological uptake from plants piercing the protective cover over the disposal site and making available toxic and radiologically active materials directly or indirectly to grazing animals (i.e., sheep, pigs, cattle, etc.) and other food chain animals, including man, should be discussed.

To specify "nondegradation" (page 2560) as a proposed ground water protection standard would be very desirable but highly impractical. Enforcement of nondegradation standards at some distance from an existing site may be unrealistic because of the contamination that may already be present in the ground water. For a new site, the benefit of imposing a nondegradation standard and the necessity of confining all tailings so that no interface exists between ground water resources and the tailings in the disposal site would also seem impractical.

While the use of a concentration standard is necessary, it may be inadvisable to set a universally used distance standard for existing sites because of the extent of contamination, resources available for cleanup, and possible variations in soil types, subsurface geologic conditions (i.e., fractured and jointed strata, caverns, aquifers, faults, etc.), ground water flow paths and rates, and other factors. The use of a site specific distance standard might be more practical and, therefore, should be explored. For a new site, the above-mentioned problems either don't exist or would be considered in selecting a site. Thus, the establishment of a universal distance standard for new sites seems more justified.

As explained above, the application of a ground water protection standard at 1.0 kilometer for an existing site may not always be justified. The distance may sometimes be too great if it allows a larger area which isn't already

F-8

Page 3 - Environmental Protection Agency

contaminated to become contaminated before mitigating action would have to be taken or required. The application of a standard at .1 kilometer from a new site seems justifiable provided mitigation efforts can be successfully implemented to prevent degradation of ground water resources beyond the distance requirement.

No mention is made in the proposed rules on the type, frequency, and depth of measurements that would have to be made to determine the compliance status with the proposed standards.

We appreciate the opportunity to review these proposed rules.

Sincerely yours,

Frank S. Lisella, Ph.D.
Chief, Environmental Affairs Group
Environmental Health Services Division
Center for Environmental Health

F-9

DEPARTMENT OF HEALTH & HUMAN SERVICES
Public Health Service
Food and Drug Administration
Rockville MD 20857

MAY 18 1981

A-79-25
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CENTRAL DOCKET
SECTION

Environmental Protection Agency
Docket No. A-79-25, West Tower Gallery
401 M Street, S.W.
Washington, D.C. 20460

Dear Sirs:

Members of the Bureau of Radiological Health staff have reviewed the health aspects of the Draft Environmental Impact Statement for Remedial Action Standards for Inactive Uranium Processing Sites and the proposed rule (46 FR 2556), January 9, 1981.

The attached comments are offered for your consideration. In general, we find the approach of the Draft EIS and proposed rule to be appropriate. Because of the possible implications this action may have on the issue of acceptable radon levels in residences (particularly where energy savings measures have been applied), the assessment of bioeffects and rationale for cleanup and disposal limits needs to be very carefully considered.

Thank you for the opportunity to comment on the proposed rule and EIS.

Sincerely yours,

John C. Villforth
Director
Bureau of Radiological Health

Attachment

DEPARTMENT OF HEATLH AND HUMAN SERVICES
FOOD AND DRUG ADMINISTRATION
BUREAU OF RADIOLOGICAL HEALTH
ROCKVILLE, MARYLAND 20857

May 1981

Comments on

(1) Draft Environmental Impact Statement for Remedial Action Standards for Inactive Uranium Processing Sites (40 CFR 192) EPA 520/4-80-011, Dec. 1980

(2) Proposed Disposal Standards for Inactive Uranium Processing Sites; Invitation for Comments (46 FR 2556), Jan. 1981

1. The EIS appears to be deficient by not addressing the problems that could be expected when designing an adequate monitoring program to determine compliance with the standard. In selecting the proposed standard, it is stated on page 8-22, second paragraph, "that the disposal standard could be viewed as a performance standard, stating conditions to be satisfied without addressing the means." Likewise, for the cleanup standards, it is stated on page 8-25, first full paragraph, that we also expect that appropriate sampling techniques will be established to locate and identify tailings material, determine its concentration of radium, and verify compliance with the standard." The experience of Federal and State agencies and industry in measuring radon in occupied or occupiable buildings has demonstrated the many variables that directly influence the radon concentration. Also, it is likely that measurement of working levels close to the proposed standard will result in both false positive and false negative values. Statistical methods for handling such problems need to be addressed. We strongly believe that a section should be added to the EIS that addresses acceptable measurement and sampling techniques and analyses for both indoor and outdoor radon-226, and gamma radiations. Standard methods should be referenced in the standard that are commercially available and provide reasonable assurance that they would give results that would meet the requirements of the standard.

2. The proposed rule and EIS states that the remedial action program for the disposal of residual radioactive material shall be conducted in a way that provides a reasonable expectation that the standard will be met for at least one thousand years. The EIS is replete with qualification statements relating to alternative disposal techniques that do not appear to support the long term premise. These include:

a. page 6-8, first paragraph - "Stabilization requires careful site selection, and durable surface treatments. Disposal in a suitable location deep underground appears to be the better way to avoid disruption of tailings by natural events or people."

b. page 6.8, paragraph 3 - "The longevity of any control method is difficult to quantify. Certain methods should last longer than others, but experience with all control methods is quite limited, especially considering the time that tailings will remain hazardous."

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c. Page 6-9, paragraph 1 - "Since longevity can only be described in broad terms, it is impossible to relate the costs of specific long lasting control methods directly to estimate the adverse health effects they will avoid."

d. Pages 2-10 and 2-13, Stabilization discussion from Phase I studies - "The State of Colorado adopted regulations in 1966 for stabilization and control of uranium mill tailings by mill owners." "In no case, however, was it found that the results could be considered entirely satisfactory. Some erosion and loss of cover was noted in all cases, and the vegetation was generally not self-sustaining without continued maintenance, usually including watering and fertilization. Thus, the stabilization work done to date represents a holding action sufficient for the present, but not a satisfactory answer for long-term storage."

e. Page 5-3, first paragraph.- "Maintaining the integrity of thin, impermeable covers over periods even as short as tens to hundreds of years, however, is highly uncertain under the likely range of chemical and physical stresses."

Despite these stated limitations of current assessment models and disposal methods, the EIS then concludes:

- Page 5-12, third paragraph.- "Our general belief is that stability against natural forces could reasonably be expected for a few hundred to a few thousand years by dealing with the problem on a case by case basis and taking site-specific factors into account."

- Page 8-4, first paragraph.- "Methods for controlling radon emissions from piles are available. The most straight forward methods call for burying the piles or covering them with appropriate combinations and thicknesses of soils with erosion resistant surfaces. We believe the basic capabilities of these methods to control radon releases, although largely untested, are understood."

3. Despite the limitations noted above, the proposed rule states on p. 2561, col. 1, that for implementation "computational models, theories and expert judgment will be major tools in deciding that a proposed disposal system will statisfy the standard" (for at least 1000 years), and further notes that "Post-disposal monitoring can serve only a minor role in confirming that the standards are satisfied." In view of the limitations of current knowledge of disposal methods noted in the EIS, post-disposal monitoring is probably the only way to confirm the standards are satisfied. Further, it would appear that applications for approval of a disposal system will require extensive study, pilot projects and computational arguments regarding meeting the 1000 year limit.

It is possible that the data from DOE's research studies, the engineering assessments, and more recent experience from stabilization or other alternatives could be used to provide more definitive assurance on the longevity of the control alternatives? If that is the situation, then these findings should be fully assessed in the EIS.

4. The EIS requires further elaboration as to the impact of the standard (radon emission and gamma dose rate values) on the cleanup of naturally occurring levels in the vicinity of processing sites. Table 7-1 seems to indicate that 10%-20% of normal buildings will require remedial action under proposed 192.12(b). It is our understanding that EPA has been assessing the extent of elevated radon and its daughter concentration in residential structures that are believed to result from high natural radioactivity deposits, radon in the water supplies, and residences that have been fully insulated as an energy savings measure. It would be helpful if additional material were included addressing the impact of these aspects on the levels of radon observed in residences. The EIS should also discuss the feasibility of remedial actions to achieve conformance with the proposed standard in such structures.

5. In general, Section 4, Health Effects, is a reasonable and well written statement. While the authors try to describe a worst case situation, this may not have been achieved in one important respect; i.e., they use a simple linear extrapolation from higher levels to lower levels of exposure. The preponderance of uranium miner data from a number of countries show a concave downward curve at lower exposure levels. The specific relative risk coefficient selected may compensate somewhat for the lack of linearity. Another non-conservative assumption is that population sizes will remain constant for a source which is essentially permanent.

6. There are a number of places in Section 4 where documentation is needed. These and other specific editorial comments follow:

Pages:

4-5, line 8 Change epithelium to epithelial.

4-6, par..1 Add "after considering the difference in the volume of inspired air between working miners and people in average situations." at the end of this paragraph.

4-6, par. 3 Next to the last line, omit "many of whom smoked." If a statement on smoking is necessary, one to the effect that miners smoked somewhat more than the general population would be more appropriate. The effect of this smoking differential has been estimated to increase the expected number of lung cancer deaths by about 50%.

4-8, par. 3 First sentence, clarify whether these WLM have been adjusted for differential breathing rates of miners versus the general population.

Pages:

4-9, par. 2 Add "an additional" before "0.01 WL" in line 10.

Add "to 1.8%" to the end of the sentence in line 15; on the next line "estimate" is misspelled and add "an additional" before "0.01 WL." The paragraph should state whether or not a latent period was used in the "life table" analysis. Shouldn't risk estimates for a three times greater risk to children factor be given.?

4-9, par. 3 The last sentence which starts on the page is unclear and seems to contain an error.

4-17, par. 2 The sentence on lines 7 and 8 seems to be a non sequitur.

4-30, par. 2 In line 3, insert "population" before "impact," and in line 4, add "although the dose to individuals living and working near piles may be substantially elevated." at end of sentence.

4-30, par. 3 Delete "--but not its probability of occurring--" as it is doubtful if such situation exists.

4-31, -32 The origin of the risk statistics should be referenced as well as the method of arriving at the numbers in these tables.

4-37 In line 3 "oxidized" is misspelled.

4-38 The inclusion in line 5 of all sites disagrees with the title of Table 4-11. It is not clear to what the last sentence in paragraph 1 refers.

4-38, par. 2 In line 3, does regional population mean local plus regional, as defined in this manuscript?

6. Appendix B provides details on cost estimates for the various disposal alternatives. Section 4 provides a discussion of the health effects of radon and its daughters. It would be beneficial if the information and data from Appendix B and from Section 4 could be collated to formulate a cost-benefit analysis and be included in the EIS as a separate section.

A-79-25
IV-D-73

TENNESSEE VALLEY AUTHORITY
NORRIS, TENNESSEE 37828

JUN 12 1981

Docket No. A-79-25
U.S. Environmental Protection Agency
Central Docket Section, West Tower Lobby
401 M. Street, SW
Washington, DC 20460

Dear Sir or Madam:

We are pleased to provide the enclosed comments on the proposed disposal standards for inactive uranium processing sites and the "Draft Environmental Impact Statement for Remedial Action Standards for Inactive Uranium Processing Sites (40 CFR 192)," EPA 520/4-80-011. The standards, designated as 40 CFR 192, Subparts A, B, and C, were published in the January 9, 1981, Federal Register (46 FR 2556-2563). Our comments on Subparts B and C, excluding Table A (45 FR 27366-27368 and 45 FR 27370-27375, April 22, 1980), were previously transmitted to you on August 27, 1980.

We support the establishment of guidelines for the cleanup of inactive uranium processing sites. It is clear that some type of stabilization cover and isolation are needed for these areas to protect the health and safety of the public living nearby. We recommend, however, that the final standards should recognize practical constraints and be made sufficiently flexible to assure reasonable and cost-effective implementation when applied to specific sites. Cost effectiveness is an especially important factor since it is likely that these standards will become the model from which guidance for active sites will be drawn.

We hope as a consequence, that EPA will take a second look at the proposed standards to evaluate the costs and benefits of the measures discussed. Radon releases from nonoperational mill sites with minimal cover and stabilization are a small fraction of releases due to natural sources (background). Rigid application of the cleanup criteria as now proposed would not, in our view, accomplish any measurable benefit to the long-term health and safety of the general population. There appears to be less expensive yet equally reliable means which, in most cases, will adequately protect nearby residents.

Also of particular concern is EPA's choice of 0.015 WL (including background exposure) for an annual indoor standard. This decision simply ignores the fact that in many areas of the country, a significant percentage of structures contain natural background readings of 0.010

to 0.015 WL and above (see 45 Federal Register 43510 (June 27, 1980)). While in theory the 0.015 WL can be obtained in some situations, it is economically impractical in others. This fact, coupled with the knowledge that at such low levels there is no conclusive evidence demonstrating measurable health effects, we believe requires EPA to clearly justify the need, practicality, and benefit of a 0.015 WL value (including background). Moreover, we suggest that the promulgation of any indoor radon criteria is premature until the results of national studies which are underway can be evaluated.

We appreciate the opportunity to comment on the standards and subject environmental impact statement.

Sincerely,

Mohamed T. El-Ashry

Mohamed T. El-Ashry, Ph.D.
Assistant Manager of Natural
Resources (Environment)

Enclosure

ENCLOSURE

TENNESSEE VALLEY AUTHORITY COMMENTS ON THE
U.S. ENVIRONMENTAL PROTECTION AGENCY'S (EPA) PROPOSED
DISPOSAL STANDARDS FOR INACTIVE URANIUM PROCESSING SITES,
40 CFR 192 (46 FR 2556-2563), AND DRAFT ENVIRONMENTAL
IMPACT STATEMENT (DEIS) FOR REMEDIAL ACTION STANDARDS
FOR INACTIVE URANIUM PROCESSING SITES, EPA 520/4-80-011

40 CFR 192 Comments

1. Different types of radiological standards are proposed for disposal sites and open lands, that is, a radon-222 emanation rate criterion for disposal sites and a radium-226 concentration criterion for open lands. From a practical viewpoint, both of these standards will be very difficult to apply while cleanup and decommissioning activities are underway. We envision that it may be necessary to predict compliance or noncompliance with these criteria during decommissioning activities involving the use of heavy earthmoving equipment and, thus, a potentially high expense would be incurred to maintain equipment and personnel availability. A rapid, practical, and acceptable method for assuring compliance is therefore necessary. Neither the standards nor the accompanying supplementary information address sufficiently the methodologies available and acceptable for implementing the standards. For example, we believe that the use of gamma survey techniques during decommissioning operations should be discussed as a methodology for complying with the criterion on radium-226 concentrations. The use of such a methodology would have clear benefits in almost every case, but certainly in those cases where tailings are to be disposed of at a new site and the existent site must be decontaminated and reclaimed with uncontaminated borrow and top soil.

2. Section 192.12(a)--It should be made clear that the 5 pCi/g value is an above-background value. The standard should be more explicit in this regard. Also, there does not appear to be any practical method of discrete sampling that can ensure that "any 5 cm thickness" or "any 15 cm thickness" does not contain in excess of 5 pCi/g of radium-226.

3. Section 192.12(b) and Table B--The value of 0.015 working levels was determined using an assumed background concentration in homes of 0.004 WL and information on remedial actions in the Grand Junction, Colorado, area. (In the Grand Junction area, background is apparently about 0.007 WL on the average.) However, there is great variability in radon decay product concentrations in structures and data indicate that a significant percentage of homes may contain background concentrations in excess of 0.010 or even 0.015 WL. A reasonable summary of the limited data available is found in the June 27, 1980, Federal Register (45 FR 43510).

4. Section 192.12(c)--The methodology for determining compliance with this standard is not apparent. We recommend additional discussion regarding implementation of this criterion using available data and practical modeling techniques.

5. Section 192.20(a) and (b)--A practical problem that should be addressed in discussing and implementing the standards is the presence of windblown or other tailings on open lands where risk to cleanup personnel or the environment may exceed the cumulative future risk to the general public or environment from the continued presence of the tailings. Such areas include bluffs, steep hills, riverbanks, and marshes. The presence of tailings in such areas has been confirmed by surveys conducted by EPA and other agencies at inactive uranium processing sites. The use of professional judgment or a regulatory-agency assessment to approve on a timely basis the use of less stringent standards in these areas should be addressed.

DEIS Comments

1. Compliance with the proposed radiological standards (radon emanation and radium concentration) would be extremely difficult to predict during decommissioning operations involving use of heavy equipment.

Numerous gamma surveys of tailings sites have been conducted at inactive uranium mills. For example, see EPA's technical document ORP/LV-75-5. Gamma survey criteria were used for the cleanup of windblown tailings at the Shiprock mill. This experience should be mentioned in the DEIS.

The criteria for cleanup and the implementing methodologies to determine compliance with the criteria must be practicable. Because measurement of radon emanation or radium concentrations is very time-consuming, use of such measurement would impose great hardship on decommissioning activities. We suggest further discussion of practicable methods to use on a timely basis during decommissioning operations. A related issue is the part of the standard for open lands that addresses radium concentrations in "any 15 cm layer below one foot." Implementation methods are again unclear and should be discussed in more detail.

2. Based on our experience at the inactive Edgemont uranium mill in South Dakota and the experience of other agencies in their surveys of more than 20 inactive uranium mills, windblown tailings may be located on open lands in areas that preclude practicable cleanup. For example, these tailings may be located in areas of rough terrain where the safety risk to personnel performing cleanup operations would exceed the cumulative future radiological risk to the general public. In these relatively uncommon situations, the public health and safety might be better served by leaving these windblown tailings where they are. We concur with the Subpart C proposals regarding exceptions in such circumstances. Also, timely action must be ensured regarding decisions about use of less stringent criteria for cleanup of small, localized areas when practicability of cleanup is questionable. This should be further discussed in the environmental statement.

3. Page 4-6, third paragraph--It is stated that, "risk estimates (of lung cancer) for the general public based on these studies of miners are far from precise." Four statements are given to support this conclusion. However, on page 4-8, first paragraph, it is stated that, "information from the studies of miners can yield estimates, if not predictions, of the risks from radon decay products to the general population." If the studies supply information which is "far from precise," it is not clear how these same studies can be used to provide meaningful information for estimates or predictions of risks from radon decay products to the general public. It would be helpful to include a comprehensive appendix in the DEIS that presents the relevant assumptions and calculational methodologies.

4. Page 4-20, first complete paragraph--Reference is made to a study of 21 houses in New York and New Jersey. It is implied that an average of 0.004 working levels (WL) characterizes these homes with respect to concentrations of radon decay products. This average ambient concentration is assumed to be representative of ambient household concentrations in the western area where uranium milling takes place. We believe that this assumed value seems too low and unjustified by other available data. Reference should be made to data presented in the June 27, 1980, Federal Register (45 FR 43510). These data, summarized by the Radiation Policy Council, are indoor residential concentrations for about 500 homes. The annual average concentration of radon decay products was measured in many of these homes with the weighted mean annual average concentration being about 0.010 WL, over twice the 0.004 WL value stated by the document.

5. Section 7.6 and Table 7-1--As noted above, the indoor radon decay product concentration data presented by the Radiation Policy Council should be included.

1st District, Utah

Committees:
Interior and Insular Affairs
Standards of Official Conduct

Washington Office:
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A-79-25
IV-D-83

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June 15, 1981

ANR/Rosenbaum
cc: (BB) cc: CFA
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AL/LM
BH

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JUL 01 1981
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SECTION

U.S. Environmental
Protection Agency
Docket No. A-79-25
West Tower Gallery 1
401 M Street, S.W.
Washington, D.C. 20460

To Whom It May Concern:

This letter constitutes my ① comments on the Draft Environmental Statement for Remedial Action Standards for Inactive Uranium Processing Sites (40 CFR 192).

The need for cleanup of radioactive tailings at the old Vitro uranium processing site in Utah helped stimulate passage of the Uranium Mill Tailings Radiation Control Act of 1978 (PL 95-604). This act applied general standards of radiation control which not only necessitated cleaning up the Vitro site, but 24 other processing sites across the nation.

Other than Vitro, four sites are located in Utah: Hite, Monticello, Green River and Mexican Hat. Two of these four tailing sites were removed from further study, with the Monticello site being on Department of Energy land and the Hite tailings having been covered by the waters of Lake Powell.

The proposed remedial action at Vitro is the complete removal of the tailings. Both the Mexican Hat and Green River sites would only incorporate stabilization of the tailings to prevent further erosion and dispersal of the radioactive materials. The total cost of the 21 remaining projects would be $200 to $300 million (FY '78 dollars).

On a general level, the Draft EIS is very factual and well referenced. There are, however, some technical deficiencies in the statement. Beyond difficulties in readability for a non-technically oriented reviewer, the DEIS apparently has some more serious technical shortfalls: there has been a general lack of specific, on-site studies; data is incomplete, and not comprehensive; the individual cost of remedial action for each tailing site is lacking; and the entire process is over one year late as mandated by PL 95-604.

Of more specific concern is the process under which sites were determined to have unacceptable radioactivity levels. The following points illustrate inconsistencies which I found in the statement:

---

1. The .015 units of radon level for acceptable radon concentrations in buildings seems unrealistic in light of the fact that many structures with poor ventilation naturally accumulate levels of radon equal to or higher than .015 units.

   Table 7-1 of the statement confirms that fact, indicating that up to 20 percent of the buildings in colder regions of the nation, those with heavy insulation, can have these high yet quite natural radon levels. A specific example of how this normal activity can frustrate unrealistic regulations is detailed in Table 7-2. The table shows a similar project in Grand Junction, Colorado, wherein the Federal government has removed radioactive tailings from beneath 217 schools and homes. Yet, 60 (almost one-third) of the buildings "have been treated but not yet brought below the action level."

   The radon standard needs to be relaxed or modified to achieve realistic radon level reductions for buildings. Any radiation control programs under the current regulations would be futile.

2. Table 4-2 projects fatal lung cancer rates for people 40 miles away from the disposal site. From this distance, the radiation received from the tailings would be statistically negligible, being only one-thousandth of one percent of the background or normal radiation level. Factors such as elevation, home building materials, etc., become much more important at these radiation levels.

3. While radioactive levels for disposal should be tighter than those for the cleanup of already existing tailing sites, the cleanup standard can be more restrictive than the proposed disposal standards. The cleanup standard applies to levels of radiation as they occur in the soil, rather than at the surface, as is the case with the disposal regulation. The five units of radium which are allowed in any thickness of soil for cleanup sites can be as low as .2 units at the surface after topsoil is spread over the tailings, as will be the likely procedure. This is one-tenth of the disposal regulation which is two units.

   Since radioactivity levels at the surface are the main concern, the standards should be changed to address this contradiction. This may be achieved by limiting radioactive levels to be five units within the soil or two units at the surface, whichever is less restrictive.

F-11

4. The average soil contamination from a tailings site must not exceed five units of radium in any 5 cm thickness of soil within one foot of the surface. It is quite possible that large windblown areas, whether it be across western deserts or suburban lawns, would be required to have the top layer of soil removed in order to satisfy this regulation. A more environmentally and economically sound standard should be established, perhaps increasing the 5 cm thickness to 15 cm.

5. The five units of radium level are too restrictive. Table 6-2 details remedial actions with their anticipated benefits. The five unit standard should avoid 98.9 percent of the hazards presented to the public. On the other hand, a ten unit level would avoid 97.8 percent of the hazards, a reduction of only 1.1 percent, at a much lower cost. Therefore, a less restrictive radium level should be considered.

6. Finally, it appears that many projects have been included for cleanup which should not have been. It is projected in Table 4-1 that approximately one life per year is lost as a result of the heavy concentration of people living in close proximity to the Vitro site. This indicates a very substantial hazard which should be remedied. However, at the Mexican Hat site, only one life in 20,000 years is projected to be lost with even fewer at Green River.

   Remedial action is recommended for the sites in spite of the fact that the statement itself is designed to realize benefits only within a 1,000 year period. A longer time frame "would not be wise."

In summary, in my opinion the Vitro site should be cleaned up as soon as possible since it presents a very serious health hazard. However, remedial action at Mexican Hat and Green River should be halted until more substantial health hazards can be associated with them.

Sincerely yours,

James V. Hansen
Member of Congress

JVH:Hs

F-12

U.S. Department of Justice
Land and Natural Resources Division

A-79-25
IV-D-77

Office of the Assistant Attorney General
Washington, D.C. 20530

June 25, 1981

Docket No. A-79-25
Environmental Protection Agency
Central Docket Section
West Tower Lobby
401 M Street, S.W.
Washington, D.C. 20460

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JUN 25 1981
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To Whom It May Concern:

We appreciate the opportunity to comment on these proposed regulations. We certainly support the mandate to cleanup and dispose of inactive mill tailings at the designated sites in a safe and environmentally protective manner.

There are two issues on which we wish to comment.

Cost Recovery

To fulfill the Attorney General's responsibilities for obtaining reimbursement for costs of remedial action, UMTRCA, Section 115(b), 42 U.S.C. 2021, cost accounting documentation yielding admissible evidence sufficient to show the bases for actual expenses must be followed and available for potential later litigation. Checklists including cost documentation procedures for on-scene coordinators already prepared for §311, Clean Water Act, and to be drafted for "Superfund" should be adaptable for this purpose. The attached memorandum on cost documentation for Superfund implementation outlines relevant considerations in general. The Department would be pleased to assist in the development of a checklist tailored to UMTRCA cost recovery. In that connection, you may contact Mary Anne Maul, Environmental Enforcement Section, (202) 633-5467.

Costs

The DEIS, at 6.1-6.6, omits mention of the fact that costs may be recovered for all or any part of the expenses of cleanup and disposal, supra, thereby lessening any economic impact even further. While not an economic impact of the project itself, the contingency of cost recovery does present the ultimate potential of whole or partial reimbursement. Therefore, the DEIS should include mention of cost recovery in assessing economic impact.

Thank you for your consideration of these comments.

Sincerely,

Carol E. Din

Carol E. Dinkins
Assistant Attorney General
Land and Natural Resources Division

Attachment

Stan Lichtman

A-79-25
IV-D-84

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

JUL 1 1981

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Dr. David M. Rosenbaum
Deputy Assistant Administrator
for Radiation Programs
401 M Street
Washington, D.C. 20460

Dear Dr. Rosenbaum:

This letter is in response to your request for our review and comments on the proposed disposal and cleanup standards for the uranium mill tailings remedial action program under P.L. 95-604, the Uranium Mill Tailings Radiation Control Act of 1978. In general, we agree with the disposal standards, finding them to be reasonable in light of our experience in mill tailings licensing, research and regulations development. It is considered that standards at least as stringent as those which you have proposed are necessary in order to provide adequate protection of the public health and safety. However, there are a few aspects of the disposal standards which concern us. These areas relate to the proposed radon release limit, the proposed period of application for the standards, and the proposed standards for groundwater protection.

As proposed, the standard requires that the average annual release of radon-222 from the tailings not exceed 2 pCi/m^2-sec. The clarifying note added to this final proposed version of the EPA standard recognized that radon emissions will come from both the tailings and the cover materials and it is stated there that, "After disposal, the radon emission standard is satisfied if the emission rate is less than or equal to 2 pCi/m^2-sec plus the emission rate expected from the disposal materials". It is recommended that the standard be clarified by replacing the words "disposal materials" with the words "cover materials". Further, this wording appears to indicate that radon flux measurements will be required to determine compliance with the EPA standard following reclamation. NRC's approach to this issue at active tailings sites (set forth in Criterion 6 of Appendix A to 10 CFR 40) requires disposal, utilizing a minimum of three meters of earth cover, which will result in a calculated reduction in surface exhalation of radon emanating from the tailings to less than 2 pCi/m^2-sec.

NRC envisioned the compliance monitoring program would primarily involve confirming that final cover thicknesses and shapes are as specified in an approved disposal plan. Radon flux and concentrations are highly variable because they are dependent on such factors as temperature, wind speed and barometric pressure which are also variable. Therefore, it can take at least a year to make definitive measurements of radon flux. The only practicable way to guide and to gauge the acceptability of cover placement by heavy earthmoving equipment is to specify, and then to measure, a given cover thickness. Flux measurements cannot reasonably be used for this purpose.

The second area of concern referred to above relates to the proposed period of application for the disposal standards. As indicated in our comments on previous drafts of these proposed standards, it is considered that the period of 1,000 years (being specified as the time over which the standard will apply) must be a minimum. It is recognized that, as proposed, the protection standards must be satisfied for at least 1,000 years. However, it is recommended that the Statement of Considerations in the accompanying Federal Register Notice more strongly and specifically emphasize the need to design for longer periods than 1,000 years where practicable. For example, it has been proven practicable to design disposal systems for periods longer than 1,000 years at least with respect to certain factors such as the potential for impacts caused by flooding. Our rationale on this matter is discussed more fully in our February 13, 1980, and September 23, 1980, letters to you on this same subject.

With respect to groundwater protection, the proposed standards in Section 192.03(b)(2) prohibit an increase in the concentration of a substance in an aquifer where the concentration of that substance already exceeds the specified levels. This requirement essentially constitutes a non-degradation standard in terms of specific substances. Under certain circumstances, however, some degradation may not in any way affect the current or potential use of the water. Thus, it is recommended that consideration be given to revising the provisions to require no deterioration of groundwater supplies from their existing or potential uses.

Finally, while we consider the cleanup criteria to be conservative, we have some reservations about their possible lack of flexibility in application. We would recommend use of these standards on a trial basis

to determine their practicability prior to finalizing them. Another alternative might be to consider the criteria already used at Grand Junction since there is a long implementation history to draw upon.

Sincerely,

John B. Martin, Director
Division of Waste Management
Office of Nuclear Material Safety
and Safeguards

A·79-25
IV·D-90

Department of Energy
Washington, D.C. 20585

July 15, 1981

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JUL 17 1981
CENTRAL DOCKET
SECTION

Ms. Kelsey Selander
U.S. Environmental Protection Agency
401 M Street, S.W.
Washington, D.C. 20460

Dear Ms. Selander:

This is the Department of Energy's response to the Agency's request for formal comments on the Draft Environmental Impact Statement (DEIS) for Remedial Action Standards for Inactive Uranium Processing Sites (EPA 520/4-80-011, December 1980), and the proposed standards that were published in the Federal Register on April 22, 1980 and on January 9, 1981. For the past year and a half we have expressed our concerns to the Agency in letters and through meetings with its staff.

Of particular concern is the interim cleanup standards that the Agency has published. Implementation of these standards (in other cleanup programs) has been shown to be costly and technically difficult. The major reason for these difficulties is that the proposed extremely low single-valued standards must be applied to open lands and structures where there are variations in the natural occurrence of radioactivity, and where the proposed standards are near or below background in many cases. The concept of "reasonable assurance" contained in the preamble to the standards is too vague to be effective for assuring compliance, and we want to avoid any use of the criteria for exceptions wherever possible. If the remedial action program is to be conducted at the lowest possible cost to the taxpayer without jeopardizing public health, there must be a reasonable range of numerical values in the standards.

Flexibility is needed in the final standards not only to facilitate the cleanup at the lowest possible cost of the inactive uranium processing sites and vicinity properties that are covered under Pub. L. 95-604, but also to facilitate cleanup of radioactivity contaminated sites under two other cleanup programs the Department conducts. The mill tailings standards will set a precedent, for the cleanup of residual radioactive material at sites where nuclear operations were formerly conducted for the Manhattan Engineer District and the Atomic Energy Commission, at surplus radioactively contaminated DOE-owned facilities, and at private properties in their vicinity. If the proposed standards become applicable, the necessity for compliance will increase the cost and time required for these cleanup programs.

We are, of course, as concerned as you are about the protection of the public from exposure to levels of radon and its decay products that may pose potential and significant health hazards. The Department will make every effort to eliminate any potential hazards and to concomitantly keep the costs of conducting radiological surveys and remedial action operations as low as possible. However, we feel it will become difficult to justify requests for Congressional appropriations for a program to meet standards that according to the Agency's estimates will only prevent about two deaths per year as a result of radon emanation from the 25 inactive uranium processing sites over the present rate of about 92,000 deaths per year from lung cancer.

The following is a discussion of our specific concerns regarding the proposed standards and the accompanying Draft Environmental Impact Statement. Suggested alternatives to the proposed standards which, if adopted, would allieviate our concerns are included. Our comments here parallel and supplement those we have made to the Agency since January 1980 and are also provided in a capsulized form in Enclosure 1.

Radon Flux and Dispersion

The mathematical models the Agency used to estimate radon dispersion from unstabilized piles are in disagreement with field measurements of radon concentrations versus distance from the piles. All the data we have seen indicate that radon concentrations are essentially the same as natural background levels at about 1/4 to 1/2 mile from the boundary of the site. As an example, Enclosure 2 indicates average contours of constant outdoor radon concentrations (pCi/l) in the vicinity of the inactive processing site in Canonsburg, Pennsylvania, where the Department is maintaining a radon monitoring network. The highest radon concentration is about 0.7 pCi/l near the boundaries of the site and decreases to average background for the vicinity (0.3 pCi/l) in about a half mile. We see no evidence of any potential health impact to the public because the highest measured concentration is only 25 percent of the Nuclear Regulatory Commission's allowable value of 3 pCi/l for nonoccupational exposure. Additionally, data collected in aerial radiological surveys at uranium processing sites in the West indicate that during the flights radon concentrations in the immediate vicinity of the sites were essentially at background levels. Further evidence that radon concentrations in the vicinity of unstabilized sites are much lower than the Agency's estimates was provided in Dr. Robley D. Evans' letter of May 27, 1981, to Dr. William A. Mills of your staff.

Because radon dispersion from unstabilized piles does not produce measurable effects even at short distances from their boundaries, we cannot support the proposed 2 pCi/m^2-sec radon flux standard, which is very close to or lower than background in many parts of the nation. As an alternative, we suggest a maximum average annual concentration of 30 pCi/l of radon at 3 feet above the surface of a stabilized pile or disposal site and 3 pCi/l at the fenced boundary of the property, and that the standard itself specify that the average is to be determined by reasonable statistical measurement protocols. Our suggested alternative is consistent with the Commission's radiation protection standards of 30 pCi/l for occupational exposure, which, for example, will protect workers, repairing a stabilized site, and 3 pCi/l for nonoccupational exposure, which will protect the public if they are exposed at the fenced boundary.

The stabilized disposal locations for tailings are to be government-owned, fenced, and licensed by NRC. It is the intent of the Act that the Government both monitor and regulate the use of the property and its perimeter. The appropriate established limits for occupational exposure to radon at a DOE operating facility is 30 pCi/l of air (which could apply on the stabilized tailings and be monitored at an elevation three feet directly above the surface) and the established fence line limit generally recognized as acceptable exposure to an exposed individual at the point of control is 3 pCi/l.

The measurement of radon flux is extremely difficult due to its variability over a large area such as a tailings pile. We therefore suggest that the standard for radon control of stabilized tailings be based upon measured radon concentration in air.

We believe that EPA may have overestimated the potential health effects from radon by a factor of 10. Even assuming that EPA's analysis of the potential health effects is correct, the Draft Environmental Impact Statement estimates that 78 percent of the total number of health effects can be avoided by stabilizing piles at the 100 pCi/m^2-sec flux value, which roughly corresponds to 30 pCi/l of radon three feet above the surface. We estimate that a potential savings in remedial action costs of $80,000 to $120,000 per acre, or a total savings of $80 to $120 million dollars could be realized if piles and disposal sites are stabilized at our suggested radon concentration values rather than EPA's proposed 2 pCi/m^2-sec radon flux standard.

Radon Decay Product Concentration Standard

The proposed standard for radon decay product concentration in structures is exceeded by, or is close to background concentrations in a significant fraction of homes that are not associated with mill tailings or other residual radioactive material. The results of some American sampling programs shown in Enclosure 3 indicate the variations that can be expected. The results of extensive Canadian studies of radon and progeny concentrations in residences summarized in Enclosure 4 parallel the naturally occurring variations found in American structures. These data lead us to conclude that an inflexible 0.015, including background, working level (WL) standard will in many cases require unnecessary and expensive removal of material to background levels or even below background.

The preamble to the standards indicates that if the allowable working level is still exceeded after all apparent tailings have been removed or otherwise prevented from affecting the interior of the structure, then the proposed standard does not require further remedial measures. However, we will have to certify during the conduct of remedial action that all apparent tailings materials have been removed. Substantiation of removal will have to ultimately provided by indoor radon decay product concentration measurements that can be influenced by sources other than tailings. Potential difficulties are indicated (a) by a recent review of post-remedial action surveys in Grand Junction indicating that 32 percent of decontaminated structures now have working levels greater than the proposed standard, and (b) by preliminary results of an analysis of radon daughter concentrations in residences that is tending to suggest that 55 percent of basements and 30 percent of first levels in U.S. homes exceed 0.015 WL.

We face the reasonable possibility of post-remedial action radiological surveys in structures indicating that certification conditions have not been met. A dilemma will exist because we will not be able to determine if the allowable radon level is exceeded because contaminated material derived from a processing site has not been removed, or because of the presence of natural radioactivity in construction materials and natural background radiation. The only alternatives will be either to remove additional materials including natural radioactivity from other parts of the structure such as from under floors and footings, or to request an exception from the Agency.

The number of significant figures in the 0.015 WL standard is questionable. Some, but not all, available instrumentation can probably determine working levels to three significant figures under controlled conditions at a given time and place. However, working level in a structure varies significantly with the time of day, the season of the year, ventilation conditions, and other factors. The collection and analysis of samples under such variable conditions over a period of a year to calculate an average annual working level is a statistical procedure. We have no evidence to convince us that 0.015 WL can be distinguished from 0.02 WL and we seriously question whether an average of 0.02 WL can be distinguished from 0.04 WL. Recognition of these real-world limitations may have influenced the formulation of the Surgeon General's flexible guidelines for remedial actions in Grand Junction, Colorado. The statistical nature of determining an annual average working level value has not changed since those guidelines were written, and we must have the flexibility to avoid the need for unnecessary and costly removal of material.

As an alternative we suggest that the standard require remedial action if the working level is greater than 0.05 WL above background and is caused by the presence of mill tailings. If the working level is between 0.01 WL and 0.05 WL above background and is caused by the presence of mill tailings, the Department would decide if remedial action is required, utilizing the so-called ALARA approach that reduces radon concentrations to a level as low as reasonably achievable, taking into account social, economic and technical considerations. If the working level is less than 0.01 WL above background, remedial action is not required. We feel that this standard (a) will impose no measurable difference in health effects relative to the Agency's proposed standard, (b) will significantly reduce implementation and certification costs, and (c) will allow us to avoid the exceptions procedure.

Radium in Soil

The proposed 5 pCi/g standard for radium-226 in soil is a level that can probably be measured with available field laboratory equipment, but at a cost. The proposed standard is not directly related to potential health effects, and we see no loss of health benefits if 10 or perhaps even 20 pCi/g were specified. Higher values would save time and cost required for coring and analyzing samples taken from large areas, and would significantly reduce the volume of contaminated natural soil that must be collected, moved and disposed of with any remedial action. We estimate for example that 5 pCi/g material could exist in soil as deep as 25 feet beneath the ground level of the Salt Lake City tailings pile. The removal of each foot of soil in decontaminating that site requires the removal, transport, disposal and backfilling of 177,000 cubic yards of soil at an estimated incremental cost of $4,600,000.

The word "any" in the specification of the occurrence of radium-226 in soil is also a major source of additional time and costs for radiological measurements and cleanup. Enclosure 5 illustrates the substantial impact of the word "any" on the time and cost to certify compliance with radium-in-soil standards. The chart is based on the most recent experiences of one of our radiological survey groups in a DOE National Laboratory. The manpower and cost estimates in the table relate to two protocols for certifying that after cleanup of one acre of ground the amount of radium-226 in the soil does not exceed 5 pCi/g. The first protocol is necessary to assure that the "any" sample specification required by the standard is satisfied, and the other protocol is a realistic statistical averaging of samples. The percentage difference in cost between the "any" and averaging protocols is significant; the "any" specification requires 68 percent more cost at 5 pCi/g than the statistical averaging protocol. There is a savings of $3,900 per acre if reasonable averaging rather than the proposed "any" sample were specified. A reasonable specification of averaging as opposed to "any" in the standards could save about $3,900,000 for certification of the cleanup of the tailings piles. This estimate of potential savings does not include the areas of wind-blown and other dispersion tailings, and vicinity properties, which might altogether triple the savings to perhaps $12,000,000 in certification costs. The savings will probably increase substantially as experience with quality assurance operations is gained during the conduct of remedial action operations.

These additional costs could be avoided if the word "any" is deleted from the standard and the standard itself is replaced by an average value of 15 pCi/g for radium in soil utilizing the ALARA approach, and the statement that "the necessary measurements are to be performed within the accuracy of available field and laboratory instruments used in conjunction with reasonable survey and sampling procedures." We believe that no measurable increase in health effects will result from adoption of the above procedure.

1,000 Year Disposal Site Compliance

The concept of "reasonable assurance" included in the proposed standard is not clearly defined. Computer codes that have been confirmed by field measurements made over time, and expert opinions are inadequate substitutes for experience. Disposal site technologies are being developed and evaluated and cost effective systems may not be available for some years with a confidence level of centuries. The alternative we suggest takes advantage of the fact that the sites are to be Government-owned and fenced, and licensed by the Commission for the indefinite future. This will allow sites to be carefully monitored and evaluated annually for 10 or 20 years to confirm the efficacy of the stabilization, and to make any necessary repairs or additions to the stabilization.

Exceptions Procedure

Flexibility should be provided in the standards themselves rather than in the preamble to the standards and in the exceptions procedure. An exceptions procedure will be costly, time consuming, and difficult to implement. The procedure could undermine public confidence in the remedial action program because significant number of exceptions is anticipated for the present form of the standards, and the public would perceive that residual health hazards exist if the standards were exceeded. Flexible standards will enable the Department to pursue the ALARA objective, minimize costs, and adjust the remedial action without measurable loss of health benefits, because implementation decisions can be based on an adjustment of design parameters rather than a requirement for meeting a single valued standard.

Water Standards

An extensive sampling program could be required to establish the concentration of substances that are now present in water in the vicinity of potential disposal sites and what concentrations are released after the disposal is completed. An even greater concern to us is the concentration of substances in ground water at sites were tailings piles will be removed. We do not have specific alternatives at this time, but we want to discuss with the Agency the basis for and potential impact of the water standards.

Cost-Benefit Analysis

A review of the cost figures presented in the DEIS by Sandia National Laboratories indicates that the EPA estimate is low by at least a factor or two, and, more likely, by a much larger factor. The Sandia analysis also illustrates the extremely high remedial action cost per health effect eliminated that can result from the conduct of extensive remedial action at remote sites. It should be noted, however, that the cost-benefit ratio is still very high if the calculation is performed just for sites in the more populous areas.

Additionally, the DEIS presents very limited and, in our view, inadequate consideration of alternatives to the standards proposed. Health effects are not estimated for any of the standards except radon flux. We feel that the final DEIS should compare the cost effectiveness sensitivity of each of the standards that are promulgated, and should include

assessment of the cost effectiveness of both more or less restrictive standards as part of its justification for the selection of the standards being proposed.

We will be pleased to discuss our comments in greater detail with the Agency.

Sincerely,

Stephen H. Greenleigh

Stephen H. Greenleigh
Acting Deputy Assistant Secretary
for Environment, Health and Safety

5 Enclosures

cc: Sheldon Meyers

EPA Proposal	Impact on DOE Remedial Action Programs/Health	Suggested Alternative	Effect of Change
2. (cont.)	(cont.) Compliance with standards may not be possible in all cases e.g., 32% of structures in Grand Junction that have had at least one remedial action still exceed 0.015 WL. **Health** The standard is near or below background levels in many structures not affected by tailings, and the resulting added benefit to public health over that resulting from a less stringent standard is questionable.		
3. Radium in Soil standard - 5 pCi/gm in "any" layer.	**Program** Extensive sampling at increased cost and time will be required since "any" is equivalent to "all" layers. **Health** The standard is not related to potential health effects	An average of 15 pCi/g and the standard itself (not the preamble) states that the necessary measurements are to be performed within the accuracy of available field and laboratory instruments used in conjunction with reasonable survey and sampling procedures.	**Program** Implementation and certification costs will be markedly reduced - e.g., 95% confidence certification that "any" soil sample does not exceed 5 pCi/g costs 41% more per acre to certify than a 90% confidence certification based on a reasonable statistical averaging procedure. **Health** No measurable increase in health effects.
4. Gamma Radiation Standard - 0.02mr/hr above background.		DOE has no objection	
5. Exceptions procedure.	**Program** Costly, time consuming and difficult to implement.	Flexibility should be provided in the standards rather than in the exceptions procedure or the preamble to the standards.	**Program** DOE will save time and cost because remedial action implementation decisions can be made in the field rather than in Washington.

Enclosure 1

EPA Proposal	Impact on DOE Remedial Action Programs/Health	Suggested Alternative	Effect of Change
1. Radon Dispersion and Radon Flux Standard - 2 pCi/m^2 above background.	**Program** Stabilization costs will be significant to meet 2 pCi/m2 - sec. standard on the tailings piles. **Health** The resulting additional benefit to public health over that resulting from a less stringent standard is questionable since: a. The value of 2 pCi/m^2 --sec is near or below background in some areas unaffected by tailings; b. Radon dispersion from unstabilized piles is overestimated by EPA computer codes; and, c. Aerial radiological surveys and DOE ground monitoring data indicate that radon concentrations in the immediate vicinity of inactive uranium processing sites (about 1/2 mile away) are essentially at background levels.	If stabilization is necessary, use 100 pCi/m^2 --sec or NRC's 3 pCi/l near the boundary line of the site.	**Program** Reduced costs and remedial action time. **Health** About 78% of EPA estimated radon health effects are avoided at the high priority sites (DEIS, page 6-7).
2. Radon 2. Radon Decay Product Concentration Standard Avg Annual Value of 0.015 WL including background.	**Program** Annual average working level is a statistical quantity which cannot be determined to 3 significant figures nor can average annual values be distinguished between 0.02 and 0.04 WL. Remedial action costs may increase as DOE may have to dig under footings, etc., because WL standard is exceeded and "apparent" tailings cannot be found.	There should be a range of working levels of: . $WL < 0.01$ above background . remedial action is not required. . $0.010 \leq WL \leq 0.05$ above background. DOE will decide if remedial action is required (if working levels are in this range), utilizing an ALARA approach. . $WL \leq 0.05$ above background, remedial action is required.	**Program** Implementation and certification costs are reduced. The exceptions procedures will be avoided. **Health** No measurable increase in health effects.

EPA PROPOSAL	IMPACT ON DOE REMEDIAL ACTION PROGRAMS/HEALTH	SUGGESTED ALTERNATIVE	EFFECT OF CHANGE
8.Stabilization or removal of a disposal site.	**Program** Will involve large sums of money and very high costs.	DOE is considering the potential implications of stabilizing only the high priority processing sites, and fencing and control access to the medium and low priority sites.	**Program** Significantly reduced implementation costs.
	Health Resulting benefit to public health is not justified by the costs of meeting the standard.		**Health** At least 58-71% of the EPA estimated health effects per century (excluding vicinity properties) will be eliminated. (See the table below.)

Fatal Cancers Per Century - Local Populations Only (1)

Certain High Priority Sites(2)	Relative Risk	Absolute Risk
Grand Junction, Colorado	29	18
Gunnison, Colorado	3	2
Rifle, Colorado (1 site)	1	1
Shiprock, New Mexico	4	3
Canonsburg, Pennsylvania	29	17
Salt Lake City, Utah	72	79
TOTALS	138 (58% of Deaths per century)	120 (71% of estimated 170 deaths per century)

(1) Data taken from EPA's DEIS

(2) Local population effects were not presented for the high priority sites at Durango, Colorado, and Riverton, Wyoming in the DEIS.

EPA PROPOSAL	IMPACT ON DOE REMEDIAL ACTION PROGRAMS/HEALTH	SUGGESTED ALTERNATIVE	EFFECT OF CHANGE
5.(cont).	(cont.) The procedure could undermine public confidence in the remedial action program because a significant number of exceptions are anticipated and the public may perceive a residual health hazard to exist if the standard is exceeded.		
6.Disposal Sites-Standards will be met for 1,000 yrs.	**Program** The standard can't be implemented because the concept of "reasonable expectations" included in the proposed standards is not clearly defined. Institutional control of disposal sites will be required for an indefinite period of time. Disposal technology will have to be developed.	Monitoring of the sites annually for ten or 20 years to establish a reasonable guide for expected longevity. The sites will be Federal property and will have to be licensed and fenced.	**Program** An assessment of the effectiveness of disposal technologies over time can be accomplished. **Health** Public health will not be adversely affected because of Federal ownership and fencing of the sites.
7.Water Standards	**Program** An extensive sampling program could be required to establish the "present conditions" that are not to be exceeded. This program will be costly	DOE has no specific alternative at this time but would like to discuss the water standards with EPA.	

Enclosure 3

INDOOR RADON AND RADON DECAY PRODUCT LEVELS WITHIN STRUCTURES IN THE UNITED STATES[1]

HOUSE LOCATION	APPROXIMATE NUMBER OF HOMES	AVERAGE RADON CONC (pCi/l)	AVERAGE WL	MEASUREMENT CONDITIONS	% ABOVE .01 WL	% ABOVE .02 WL
NY/NJ - EML						
(basements)	18	2.0	0.01	YR*	39%	17%
(first floors)	18	1.0	0.007		17%	6%
Grand Junction, CO - CDH (background)	29	(7.1)**	0.007*	YR	39%	6%
Florida						
(phosphate) - EPA & DHRS	100	(2.5)	0.015	YR	45%	29%
(background) - EPA	29	(0.5)	0.0033	YR	3%	0%
(background) - DHRS	29	(0.68)	0.004	YR	4%	0%
(background) - UF	13	0.8+	0.0046+	YR	14%	14%
Butte, MT - EPA & MDHES	56	(3.3)	0.02	YR	73%	30%
Anaconda, MT - EPA & MDHES	16	(2.4)	0.013	YR	56%	25%
Alabama and Neighbor States - TVA						
(phosphate slag, first floors)	5	(2.8)	0.017	Jan-May	40%	40%
(phosphate slag, basements)	17	(3.6)	0.018	Jan-May	76%	35%
(control, basements)	5	(2.8)	0.014	Jan-May	60%	40%
San Francisco Region - LBL	29	0.3	(0.002)	Grab DBW Closed++	0%	0%
Energy Efficient Homes (various locations) - LBL	17	4.0	(0.027)	Grab DBW Closed	76%	30%
Soda Springs, ID - IDHW (phosphate slag, basements)	100	1.4+	0.009+	* Grab DBW Closed	23%	2%
Illinois - ANL (with exposed crawl space)	22	6 houses > 10.0 pCi/l of Rn 9 houses > 5.0 pCi/l of Rn		Grab Sample DBW Closed		(41% > 0.03 WL)

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[1] Data obtained from Radiation Policy Council Task Force, position paper on Radon in Structures, August 15, 1980.

* YR means year round average under occupied conditions (air pump integrated measurements).

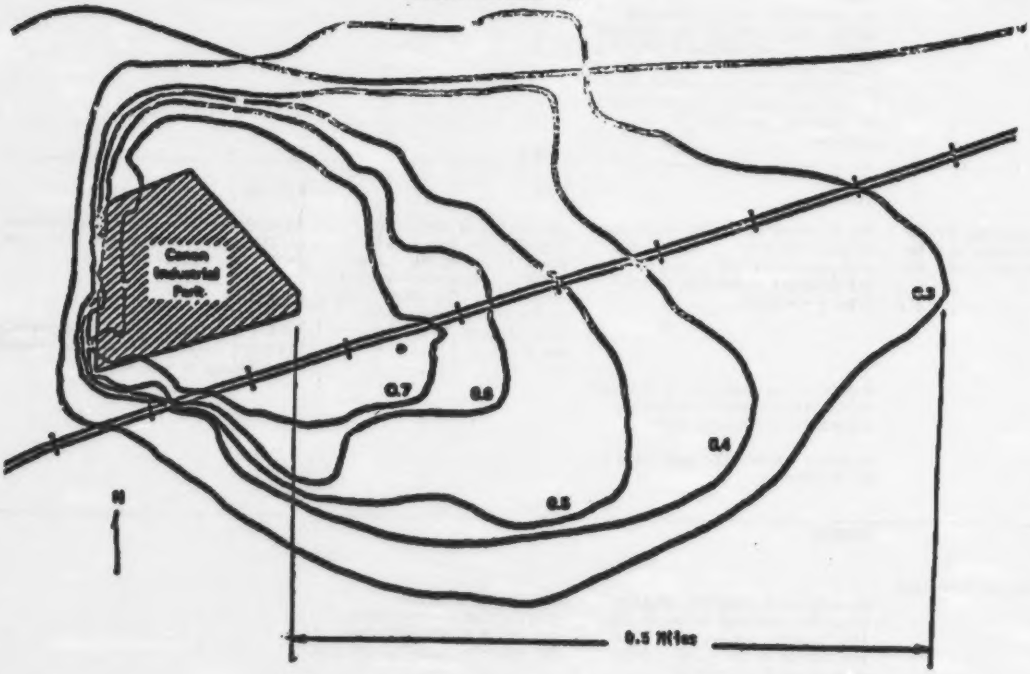
+ Geometric mean.

** Values in parenthesis are not direct measurements, but are calculated using a characteristic radon decay products/radon equilibrium ratio of 0.5 for basements and 0.41 elsewhere.

++ Doors and windows of structures were closed for a time before taking a grab sample or continuous measurement.

Enclosure 2

Contours of Equal Radon Concentration (pCi/liter)
[illegible] Industrial Park



CANADIAN RADON & RADON DECAY PRODUCT LEVEL WITHIN STRUCTURES

Enclosure 4

CITY	AVERAGE CONCENTRATION		NUMBER (%) OF STRUCTURES ABOVE		NUMBER OF STRUCTURES SURVEYED
	RADON	RADON DAUGHTERS	0.01WL	0.02WL	
Calgary, Alta.*	0.31pCi/l	0.0019 WL	83 (3%)	2 (0%)	[illegible]
Charlottetown, P.E.I.*	0.41pCi/l	0.0018 WL	66 (2%)	7 (1%)	314
Fredericton, N.B.*	0.66pCi/l	0.0028 WL	91 (11%)	15 (3%)	[illegible]
Halifax, N.S.*	-	0.0031 WL	147 (17%)	46 (5%)	[illegible]
Montreal, P.Q.*	0.09pCi/l	0.0014 WL	57 (6%)	8 (1%)	[illegible]
Quebec, P.Q.*	0.28pCi/l	0.0013 WL	30 (5%)	12 (2%)	[illegible]
St. John, N.B.*	0.27pCi/l	0.0016 WL	60 (7%)	24 (3%)	857
Sherbrooke, P.Q.*	0.33pCi/l	0.0024 WL	104 (11%)	57 (6%)	[illegible]
St. John's, N.B.*	0.30pCi/l	0.0016 WL	29 (6%)	4 (1%)	[illegible]
St. Lawrence, Nfld.*	0.83pCi/l	0.0017 WL	46 (10%)	18 (4%)	435
Sudbury, Ont.*	0.81pCi/l	0.0036 WL	130 (10%)	53 (7%)	772
Thunder Bay, Ont.*	0.04pCi/l	0.0025 WL	39 (6%)	14 (2%)	627
Toronto, Ont.*	0.31pCi/l	0.0018 WL	39 (4%)	7 (1%)	701
Vancouver, B.C.*	0.14pCi/l	0.000 WL	1 (10%)	0 (0%)	[illegible]
[illegible] Township, Ont.**1	0.32pCi/l	0.014 WL	86 (22%)	46 (13%)	343
Long Harbour, Nfld.**2	-	0.001 WL	2 (2%)	0 (0%)	179
Castlegar-Trail, B.C.**3	-	0.011 WL	70 (32%)	43 (17%)	251
Port Hope, Ont.***4	0.08pCi/l	0.003 WL	-	≥30 (3%)	[illegible]
Uranium City***4	-	0.013 WL	-	≥86 (16%)	[illegible]
Elliot Lake***4	-	0.008 WL	-	≥287 (14%)	1081
[illegible]***5	-	0.006 WL	-	≥9 (13%)	66
Bancroft Area***4	-	0.007 WL	-	≥187 (17%)	1100
Cobourg***6	0.08pCi/l	0.0015 WL	-	0 (0%)	67

REFERENCES

- * McGregor, R.G., et al, "Background Concentrations of Radon and Radon Daughters in Canadian Homes," Health Physics, V.39, No. 2 (August 1980), p. [illegible]
- ** [illegible], E.G., et al, "Background Levels of Radon and Radon Daughters in Canadian Homes," Proc. Specialist Meeting on Personal Dosimetry and Area Monitoring Suitable for Radon and Daughters Products, Paris, 20-22 Nov. 1978, NEA/OECD, 1978 p. [illegible]
- *** [illegible], B.B. and C.E. [illegible] (Atomic Energy Control Board), "Modification of the Natural Radionuclide Distribution by Some Human Activities in Canada," a paper presented at the Third International Symposium on the Natural Radiation Environment, Houston, TX, April 23-28, 1978.

COMMENTS:

1. Homes built on uranium ore tailings
2. Imported Florida phosphate rock slag used in building materials
3. Castlegar-Trail shown due to high radon in drinking water; (Radon daughter average for the 247 homes under [illegible] WL)
4. Contamination from mill tailings
5. A cobalt smelter in the area handled uranium ore and Port Hope residue
6. Control area used in Canadian Study to represent typical background values

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Enclosure 3

ESTIMATES OF TIME AND COST PER ACRE (ABOUT 4,000m²) TO CERTIFY COMPLIANCE WITH 5pCi/g RADIUM-IN-SOIL STANDARDS USING AVAILABLE MOBILE FIELD LABORATORY INSTRUMENTATION (1)

5pCi/g

- 95% Confidence that "Any" sample does not exceed pCi/g of Radium-226 in soil
  - 1 sample taken from each m^2 (4,000 total)
  - Blend and analyze composite of 25 samples from each 25 m^2 (160 total)
  - 1 of every 4 composite samples confirmed at permanent lab
  - TIME: 28 person-days
  - COST: $9,600
- 90% Confidence that a statistical average of samples does not exceed 5 pCi/g of Radium-226 in soil
  - An average of 4 samples taken at random from each 100m^2 (2) (160 total)
  - Analyze each sample
  - 1 of every 10 samples confirmed at permanent lab
  - TIME: 16 person-days
  - COST: $5,700 (3)

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(1) Mobile laboratory systems included a gamma ray spectrometer

(2) Typical ground area for a house

(3) The savings provided by statistical averaging will increase as operational quality assurance experience is gained.

U.S. House of Representatives
COMMITTEE ON ARMED SERVICES
Washington, D.C. 20515
NINETY-SIXTH CONGRESS
MELVIN PRICE (ILL.), CHAIRMAN

March 2, 1981

MEMORANDUM FOR THE RECORD

SUBJECT: Unrealistic EPA Regulations on Mill Tailings Cleanup

Interim regulations on the cleanup of uranium mill tailings were promulgated by EPA during the last days of the previous administration (attachment 1). These regulations will have serious multi-billion dollar impact and regulatory constraints on the nation's mining industry, nuclear energy program, and nuclear weapons program. For example, although the interim and proposed final standards affect inactive tailings (30,000,000 tons - cost $770,000,00) these standards will establish the precedent which will affect another 140,000,000 tons now at active mills feeding the commercial nuclear energy and weapons programs and a projected additional tonnage of 470,000,000 tailings from now until 2000.[1] The costs for disposal of the latter are unknown and the latter amounts are 22 times the inactive tonnage.

The standards for radon and radium are unduly restrictive, frequently exceeding concentrations in nature, mining complexes, and dwellings in the U.S. (attachment 2). The radon standards are based upon uranium miner lung cancer data and are considered irrelevant and invalid. The miners in question were exposed to high levels of gamma radiation, particles of uranium, radium, rock and toxic metal dust, dynamite and exhaust fumes, and heavy smoking—as well as radon. In contrast, the public off-site from the tailings, presumably to be protected by the standards, is exposed to very low levels of gamma radiation, some tailing particles, and radon levels near background. Public exposure can be mitigated by covering the tailings to reduce the gamma radiation levels and amount of wind-blown tailing particles and to reduce the radon fluxes and concentrations.

The interim radon and radium standards translated to the Vitro tailings pile in Salt Lake City by EPA will be directed primarily toward a plan for removal [of the tailings] to another location.[2] This means 2,300,000 tons of tailings and other material dug up and moved about 100 miles and buried again (91,800 twenty-five ton truckloads, 18,376,000 truck miles taking 7 years and $138,000,000 according to DOE estimates).

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[1] PL 95-604 title says that the EPA standards will be applicable to the active mill sites licensed and regulated by NRC and agreement states.

[2] From "Draft EIS for Remedial Action Standards for Inactive Uranium Processing Sites (40 CFR 192)", December, 1980. EPA 520/4-80-011

In promulgating the regulations the previous administration has neglected to satisfy the following requisites:

1. Issuing standards based upon realistically valid health effects (risk) data.

2. Issuing standards compatible with natural and technologically augmented levels of radium and radon in the U.S.

3. A realistic, integrated and comprehensive cost analysis of the regulations and their impact. (EPA estimates a cleanup cost for the inactive tailings at $300 million while DOE's estimate is $771 million and $138 million for Salt Lake City, only one of the 25 inactive sites.)

4. The potential risks to the public and remedial action workers from the tailings have not been quantified and compared to the comparable publically accepted risks.

5. EPA indicates that the standards "would prevent 200 premature deaths per century"[3] (+ 2 death per year) based solely on uranium miner data. The bases for this risk analysis is invalid and have not been technically validated.

6. The risks to the remedial action workers versus those to the public have not been quantified and compared. For Salt Lake City tailings a 7-year remedial action program to remove tailings is estimated to incur 5 fatalities and 62 injuries among the cleanup workers (attachment 3). EPA's EIS states: "these expenditures should benefit the local economy."[4]

7. Alternatives for specific tailing cleanups are still under study and not finalized. Yet DOE is proceeding on a cleanup program based upon (a) unresolved costs, (b) invalid standards, and (c) unselected and unresolved remedial action alternatives. The DOE program and NRC programs should be reoriented and coordinated to solve these problems first.

c. The mill tailings standards have not been critically reviewed in total and the current and future active tailings are at least 22 times more than the tonnage of the inactive tailings. Economic impact of these standards on the mining, energy, and defense sector have not been addressed.

9. Indoor radon standards for dwellings are still being studied by EPA, DOE, NRC and Radiation Policy Committee. Standards on indoor radon and mill tailings are closely related and should not be promulgated separately.

The inactive tailings programs have other mitigating factors. Those organizations contributing to formulating the requirements for remedial actions are often also in line to benefit economically from the standards and the remedial action programs. The federal government pays 90% + of the survey and cleanup costs on inactive sites with the states putting up 10% -; hence little incentive for cost reduction exists. The public, in the vicinity of the 25 sites, has been sensitized to the tailings risk by conservative, invalid, allusory and invidious data on lung cancer induction and a number of state governors having inactive tailings sites have been pressured to publicly advocate total cleanup. Those opposing nuclear energy and the environmental movement are lobbying for cleanup as a common thrust against nuclear energy and weapons (attachment 4).

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[3] & [4] Quote from "Draft EIS for Remedial Action Standards for Inactive Uranium Processing Sites (40 CFR 192)", December, 1980. EPA 520/4-80-011

Although the mill tailings piles cleanup problem per se is unresolved, some minimum remedial actions are needed, such as covering and stabilization to reduce gamma radiation, wind-blown particles, and radon and radon daughter immobilization. These efforts should logically continue. Also, some dwellings and public buildings were constructed on or of tailings (e.g., Grand Junction and Salt Lake City) and remedial actions on these should continue.

The mill tailings issue really involves the question of the degree of cleanup needed relative to the real risks, costs, benefits and the ensuing domino effect on the nation's further mining, nuclear, and defense activities. Fiscal brakes should be applied to the DOE, and NRC (Edgemont 50) inactive site program in FY 1981 and 1982 until the requisites to a sensible program by DOE studies in this area. Costs are escalating daily; and the future costs based on the EPA standards are unknown. These standards should likewise be held in abeyance, until a more thorough assessment of the acceptable risks, impacts, costs and remedial alternatives is performed in a timely manner. This position will not be popular with certain people in the West but plans are currently underway to dig up, transport, and dispose of tailings from several inactive sites at great cost to the taxpayers with questionable benefit. Once this precedent is established, the pressure on the active tailings will be unsurmountable starting with 50,000,000 tons of comingled tailings (attachment 5).

Seymour Shwiller

Seymour Shwiller
Professional Staff Member

SS:b

attachments (6)

ATTACHMENT 1

The Uranium Mill Tailings Radiation Control Act of 1978 (PL 95-604) requires EPA to set generally applicable standards to protect the public health, safety, and environment from hazards posed by uranium mill tailings at 25 specific inactive processing sites, located in the Western U.S. and Pennsylvania.

Three documents are germane to these standards. On April 22, 1980, EPA published in the Federal Register "Interim Cleanup Standards for Inactive Uranium Processing Sites - Part IV" and "Proposed Cleanup Standards for Inactive Uranium Processing Sites" (Attached). At the same time EPA issued a "Draft EIS for Remedial Action Standards for Inactive Uranium Processing Sites."

Basically, the standards require for at least 1000 years following disposal—that: (1) the average annual release from radon-222 from a disposal site to the atmosphere will not exceed 2 picocuries per square meter per second (2 pCi/m^2-sec)* and (2) the average concentration of radium-226 attributable to radioactive material from any designated processing site in any 5 cm thickness of soils or any other materials on open land within 1 foot of the surface, or in any 15 cm thickness below 1 foot, shall not exceed 5 picocuries per gram (5 pCi/g).+

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* 2×10^{-12} curies/m^2/sec

+ 5×10^{-12} curies/m^2/sec

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In addition, levels of radioactivity in any occupied or occupiable building should not exceed 0.015 Working Level (WL)[++] including background and 0.02 milliroentgens per hour (mR/hr).

NRC has also promulgated similar standards for active mills ("Final GEIS on Uranium Milling," NUREG-0706, September, 1980).

Similar regulations also exist for cleanup of structures of or on tailings in Grand Junction, Colorado (10 CFR Part 12 - "Grand Junction Remedial Action."

[++] About 1.5 x 10^{-12} curies/liter for radon and its decay products in equilibrium.

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ATTACHMENT 2

RADON AND RADIUM STANDARDS VERSUS NATURAL AND TECHNOLOGICALLY AUGMENTED SOURCES

		RADON RELEASE (pCi/m^2-sec)
Release Rate Standard for Cleanup		$\boxed{2}$
Background for Release Rate (U.S.)		0.5 (0.1 - 1)
	Massachusetts	1.34
	Illinois	0.56 - 1.4
	Florida (P-area)	34
Mill Tailings		20 - 1714

			RADON CONCENTRATION (pCi/l)
Air Concentration Standard (Air)			$\boxed{1.5}$ *
Background Air (U.S.)			0.2 (0.01 - 1)
Mill Tailings Levels (Air)			
	Grand Junction		11
	Monticello		4
	Salt Lake		10
	Durango		12 - 19
Well Water (642 U.S. Sites)			
		74%	< 2,000
		21%	> 2,000
		5%	>10,000
	Maine		
		15%	<100,000
		10%	>200,000
Base Metal Mines (Western U.S.)			200 - 1,000
16 Pennsylvania Coal Mines			0.1 - 147
Natural Gas (in lines)			2.3 (0.5 - 119)
LNG			10 - 150
Dwellings in U.S. (Air)			
	New York, New Jersey		1 - 2
	Butte, Montana		3.3
	Florida (100 homes)		2.5
Energy Efficient Homes			1 - 4

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* In equilibrium with daughters 1 WL = 100 pCi/l.
0.015 WL = 1.5 pCi/l

RADIUM SOIL CONCENTRATION (pCi/g)

Cleanup standard (Soil)	$\boxed{5}$
Background (U.S.)	1.1 (0.2 - 4)
Mill Tailings	65 - 1474
Drinking Water (U.S.)	0.002 - 0.036
Eggs	0.01
Calf Femur	0.072
Industrial Wastes (Some)	10 - 300
Granite	3
Coal	0.3 - 67
Phosphate Ore	42
Gypsum (FL)	33
Brick	2.6
Concrete	2

ATTACHMENT 3

X-1

RISK VERSUS RISK

A. General

Risk versus risk trade-off analyses are applied to alternative situations to determine whether or not a particular remedial action to be taken to mitigate or eliminate one risk will, in turn, create another risk. If the latter risk approaches or exceeds the former risk, the remedial action alternatives are reevaluated and other alternatives are sought.

The risk versus risk trade-off analysis is done in the fields of medicine, consumer product safety, and public and occupational health and safety. Although the overall mill tailings problem may be conducive to risk versus risk analysis; it is more readily applied to the problem on a case-by-case or site-by-site basis, considering specifically the comparative populations at risk, types of risk, and resulting risk values.

B. Hypothetical Case

The Salt Lake City Vitro tailings site is used as a hypothetical case, not considering effects for off-site properties and buildings. It is an extreme case intended to scope the problem for purposes of bounding the comparative risks of two polar alternatives. The hypothetical case alternatives examined are no remedial action versus the removal of all tailings and contaminated material from the present location to a disposal site.

In the case of the mill tailings as they are today with no remedial action, the surrounding population at risk is assumed to be working or living adjacent to the Vitro site. The primary potential risk is inhalation exposure to radon and its progeny which is above background levels within 0.5 miles of the tailings pile.[1] The secondary risk is exposure to whole body gamma radiation from radium in the tailings, which is above background within 0.2 miles from the tailings.[1] Other effects, such as inhalation of tailings particles are considered tertiary effects in this analysis and in previous analyses.[2/], [3/] The potential risk to the public is a protracted radiation risk.

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[1] DOE, "Radiation Pathways and Potential Health Impacts from Inactive Uranium Mill Tailings," p. 4 GJT-22, July 1978.

In contrast, those performing the remedial action, which is assumed to be removal of tailings and structures, are workers and truckers involved in measuring, clearing, excavating, loading, transporting, unloading, and covering tailings at the existing site and at the designated disposal site. The workers and truckers are exposed to two types of risks: (1) potential occupational injuries and fatalities, attendant with the construction, excavation, and trucking trades, and (2) potential radiological risks from intimate exposure to tailings for thousands of hours in their workplace.

There would also seem to be some risk synergism associated with the above remedial action to both the workers and public. The tailings are estimated to contain 1380 curies of ^{226}Ra (460 pCi/g average), and 2.6×10^8 pCi/sec of ^{222}Rn (550 pCi/M^2/sec) are continuously emanating from the undisturbed tailings.[2/] Other radionuclides such as $^{234, 235, 238}$U, $^{230, 232}$Th, ^{228}Ra, ^{210}Po, and ^{210}Pb are present in the tailings. While the tailings are undisturbed, all airborne activity for these nuclides except ^{222}Rn, may be considered as "not present." The total average annual airborne activity is less than 3% of the maximum permissible concentration for air at the sewage treatment plant at the site.[2/] When the tailings are disturbed in the process of their excavation and removal, the release of radon and respirable airborne particulate material will increase. Workers and public alike will be subject to higher levels of exposure during the period of remedial action. The effects upon the public from higher levels for shorter periods of exposure has not been evaluated here and should be considered in future analyses.

[2/] F. F. Haywood, ET AL., "Assessment of Radiological Impact of the Inactive Mill Tailings Pile at Salt Lake City, Utah, ORNL/TM 5251.

[3/] Ford, Bacon, and Davis Utah Inc., "Phase II - Title I Engineering Assessment of Inactive Uranium Mill Tailings - Vitro Site, Salt Lake City, Utah" April 30, 1976, GJT-1.

C. Public Population Risk from Undisturbed Tailings

Table X-1 summarizes the risks to the public as independently estimated by ORNL[2/] and Ford, Bacon, and Davis Utah Inc.[3/] Both references conclude that health effects from radiation sources, other than radon and radon progeny inhalation and whole body external gamma radiation exposure, are inconsequential, very small, or negligible.

Table X-1 shows the comparative values in health effects per year for the population within a 7-mile radius of the tailings from References 2 and 3. Reference 3 shows effects within a half-mile radius. Both assume the present population and future populations for both medium density and high density urban growth. The majority of the potential health effects occur within a 0.5 mile radius.

1. Radon and Radon Progeny Inhalation Effects

For the population potentially at risk to radon inhalation, the values are fairly close (0.4, 3, and 4 versus 0.5, 3, and 5 health effects per year respectively) for the 3 population densities assumed. This is explained by the health effects assumptions used. References 2 and 3 use a risk coefficient of 180×10^{-6} per year per WLM. By comparison, NCRP recommends a risk coefficient of 10×10^{-6} per year per WLM.[4/] Using the latter, the radon health effects would be 5% of those shown in Table X-1. The possibility exists that environmental or slightly elevated radon daughter levels do not induce lung cancer.[4/]

The data are extrapolated in Table X-2 for the current population for 1, 7, and 15 year periods and are compared to estimated effects from natural background and the expected lung cancer cases in the Salt Lake City area from all causes. The results are 0.5 effects per year, 3.5 effects in 7 years, and 7.5 effects in 15 years for the present population. The radon background health effects are about 14 times greater than the estimated radon effects from tailings and the lung cancer incidence from all causes is about 100 times the tailings incidence.

[4/] Spahn, James A., "NCRP Response to Federal Register of 6/27/80 Request for Public Comment on Radon in Structures," 7/17/80.

TABLE X-2. COMPARATIVE POTENTIAL HEALTH EFFECTS - PRESENT POPULATION WITHIN 7-MILES RADIUS OF VITRO TAILINGS SITE (RADON INHALATION)

ASSUMPTIONS	PERIOD	TAILINGS HEALTH EFFECTS	BACKGROUND HEALTH EFFECTS	LUNG CANCER ALL CAUSES SLCMA
• LUNG CANCER ALL CAUSES SLC METRO AREA = 1.2 x 10^{-4}/YEAR[3/] FOR 400,000 PEOPLE (CONSTANT) • TAILINGS EFFECTS/YR 0.5 FROM REFERENCE 3 USED • VITRO PILE INACTIVE 15 YEARS • 7 YEARS SELECTED AS CLEANUP PERIOD ONLY	1 YEAR (PER YEAR)	0.5	7	48
	7 YEARS	3.5	49	336
	15 YEARS	7.5	105	720

3/ HEW/National Center for Health Statistics, "Vital Statistics of the United States, 1968, Vol. II Mortality."

TABLE X-1. ESTIMATED POTENTIAL HEALTH EFFECTS TO PUBLIC - SALT LAKE CITY TAILINGS (ASSUMING NO REMEDIAL ACTION)*

REFERENCES	ASSUMPTIONS USED	HEALTH EFFECTS (PER YEAR)				
		TAILINGS RADON	TAILINGS EST. GAMMA	BACKGROUND RADON	BACKGROUND GAMMA	LUNG CANCER RISK (ALL CAUSES)
2/ORNL/TM 5251 (pp 81-83 TAILINGS RADON DATA "VERY CONSERVATIVE," TAILINGS GAMMA DATA "CONSERVATIVELY ESTIMATED"	SEVEN MILE RADIUS					
	PRESENT POPULATION (400,000)	0.4	0.05	7 ± 5	2.8 ± 7	NOT GIVEN
	MEDIUM DENSITY URBAN GROWTH (12,000/MI^2 OR 1,850,000 PEOPLE)	3	NOT GIVEN	32 ± 22	NOT GIVEN	NOT GIVEN
	HIGH DENSITY URBAN GROWTH (20,000/MI^2 OR 3,000,000 PEOPLE)	4	NOT GIVEN	51 ± 35	NOT GIVEN	NOT GIVEN
3/UJT-1 (p 3-34) TAILINGS RADON DATA UNCERTAINTY FACTOR ABOUT 3	SEVEN MILE RADIUS					
	PRESENT POPULATION (418,000 + 151,000 EMPLOYEES)	0.5	0.04	NOT GIVEN	NOT GIVEN	50
	MEDIUM DENSITY (1,850,000)	3	0.3	NOT GIVEN	NOT GIVEN	222
	HIGH DENSITY (3,000,000)	5	0.4	NOT GIVEN	NOT GIVEN	360
3/UJT-1 (p 3-35) TAILINGS RADON DATA UNCERTAINTY FACTOR ABOUT 3	HALF-MILE RADIUS					
	PRESENT POPULATION (1100 + 3700 EMPLOYEES)	0.2	0.02	NOT GIVEN	NOT GIVEN	0.13
	MEDIUM DENSITY (28,000)	3	0.3	NOT GIVEN	NOT GIVEN	3.36
	HIGH DENSITY (45,000)	4	0.4	NOT GIVEN	NOT GIVEN	5.40

* Exclusive of vicinity properties.

2. Direct Whole Body Gamma Radiation Effects

In Table X-3 the health effects from direct whole body gamma radiation from tailings for the present population are 0.05 effects per year, 0.35 for 7 years, and 0.75 for 15 years for the present population of 400,000. The whole body gamma radiation effects from the tailings are about 100 times less than those from radon inhalation from tailings.

3. Total Potential Health Effects to Public

Total health effects to the public are 0.55 for 1 year, 3.8 for 7 years, and 8.2 for 15 years for the present offsite population. Background health effects are about 20 times higher than those attributable to tailings.

It is emphasized that this is an engineering analysis which arbitrarily uses comparable risk coefficients used in previous analyses[2/], [3/] of the Vitro tailings. NCRP has stated: "The possibility exists that environmental or slightly elevated radon daughter levels do not induce lung cancer."[4/]

D. Remedial Worker Risk from Tailings Removal

A model of remedial action, assuming removal of the tailings, was constructed in order to scope the risk to remedial action workers. The model assumed the following parameters:

• Amount of tailings	1,880,000 tons
• Amount of other material	417,000 tons
• Total amount moved	2,297,000 tons
• Amount moved per truck	25 tons
• Total truckloads (round trips)	91,880 trips
• Distance to disposal site	100 miles
• Round trip mileage	200 miles
• Total truck miles	18,376,000 miles
• No. of truckers	50 persons
• No. of workers (tailings & disposal site)	150 persons

• No. of commuters	200 persons
• Round-trip commuting mileage	20 miles
• Total commuting mileage (2 person/pool)	3,850,000 miles
• Span time of remedial action	7 years
• Worker person-months	12,600 p-m

The following accident statistics were also assumed:

• Accident Rate (Heavy Construction Industry)[6/]	16.7/100 worker-yr
• Death Rate (1978 - Construction)[7/]	57/100,000 worker-yr
• Disabling Injury Rate (1978 - Construction)[7/]	5217/100,000 worker-yr
• Motor Vehicle Death Rate (1978)[7/]	$3.4/10^8$ miles
• Motor Vehicle Disabling Injury Rate (1978)[7/]	$131.6/10^8$ miles
• Truck Accident Rate[8/]	2.1×10^{-6} accidents/mile
• Death Rate - Truck Accidents (% Fatal)	10% (assumed)
• Injury Rate - Truck Accident (% Disabling Injuries)	20% (assumed)
• Gamma Health Effects - Workers[2/], [3/]	100 effects/10^6 person-rem/yr
• Radon Health Effects - Workers[2/], [3/]	180 effects/10^6 person-WLM/yr
• Particle Health Effects - Workers	Same as Rn effects (assumed)

[6/] U.S. DOL/Bureau of Labor Statistics, "Occupational Injuries and Illnesses in 1977 - Summary Report 561," 1979.

[7/] National Safety Council, "Accident Facts - 1979 Addition," 1979.

[8/] NRC, "Final Generic Environmental Impact Statement on Uranium Milling - Project M-25 - Summary and Text," NUREG-0706 Vol. I, Sept. 1980.

TABLE X-3. COMPARATIVE POTENTIAL HEALTH EFFECTS - PRESENT POPULATION WITHIN 7-MILES RADIUS OF VITRO TAILINGS SITE (WHOLE BODY GAMMA RADIATION)

ASSUMPTIONS	PERIOD	TAILINGS HEALTH EFFECTS	BACKGROUND HEALTH EFFECTS
• 400,000 PEOPLE (CONSTANT) 28,000 ± 7000 PERSON-REM/YR BACKGROUND EXPOSURE • 500 PERSON-REM/YEAR TAILINGS EXPOSURE • PERIODS (SEE TABLE X-2) • 100 EFFECTS/REM/YR/10^6 PERSONS WERE ASSUMED	1 YEAR (PER YEAR)	0.05	2.8
	7 YEARS	0.35	19.6
	15 YEARS	0.75	42

1. Occupational Risks to Workers and Truckers

   a. Commuting Risk

   During the process of commuting to and from work, the worker and trucker population of 200 would be expected to encounter a total of 0.13 fatalities and 5 disabling injuries. This is based upon 200 persons commuting 20 miles to and from work in 2 person carpools traveling a total distance of 3,850,000 miles (7,700,000 person-miles) during the 7-year remedial action period.

   b. Worker Risk

   In the process of excavating and loading tailings at the Vitro site and unloading and burying tailings at the disposal site, worker population of 150 would be expected to encounter a total of 0.6 fatalities and 52 disabling injuries from about 175 occupational accidents. This is based upon a rate of 16.7 accidents per 100 worker-years in the heavy construction industry, a fatality rate of 57 per 100,000 worker-years, a disabling injury rate of 5217 per 100,000 worker-years, and a total of 1050 worker-years for the 7-year remedial action period.

   c. Transportation Risk

   In the process of traveling 18,376,000 truck miles or 91,880 round trips, the trucker population of 50 and public would be expected to encounter a total of 3.8 fatalities and 7.6 serious injuries from 38 truck accidents. This is based upon an accident rate of 2.1×10^{-6} accidents per mile, and assumes a single fatality in 10% of the accidents and a single injury in 20% of the accidents.

2. Radiological Risks to Workers

   a. Radon Risk

   The measured radon concentration above undisturbed tailings at the Vitro site averages

10 picocuries per liter[9] corresponding to 0.1 WL, assuming equilibrium with its progeny. A 24-hour outdoor value of 13.4 picocuries per liter was measured at the sewage treatment plant.[3] In the process of excavating the tailings, the release rates of radon and its progeny would be expected to increase and, therefore, a value of 0.15 WL has been assumed.

Using a value of 12,600 worker-months at a continuous concentration of 0.15 WL, a total of 1890 worker-WLM (270 WLM/yr) is derived for the 7-year remedial action period. Assuming the same value used in References 2 and 3 of 180 effects per 10^6 WLM per year, one derives 0.35 fatalities among the worker population from radon and its progeny for the period of remedial action.

b. Particle Inhalation Risk

The inhalation of particles was assumed to result in a risk equal to the radon risk or 0.35 fatalities among the worker population. Further, refinement of this value should be made since some biomedical researchers indicate that respirable "hot" particles of tailings debris containing radium, radon daughters, and toxic metals could be more damaging to the lung than radon and its progeny. Workers and truckers will be exposed to high concentrations of particles during the tailings removal process.

c. Direct Whole Body Gamma Radiation

It is assumed that the whole body gamma radiation to workers is 1.1 mR/hr, based upon measurements in Reference 4. It is further assumed that 100 health effects per 10^6 person-rem would result. This yields a value of 0.25 fatalities among the worker population.

3. Total Occupational and Radiation Risks to Workers

Table X-4 summarizes the potential occupational and radiation risk to remedial action workers for the 7-year remedial action period. The potential risk is 5.5 fatalities and 64.6 injuries.

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[9] DHEW, Bureau of Radiological Health, "Evaluation of Radon 222 Near Uranium Tailings Piles," DER 69-1, March 1969.

TABLE X-4. ESTIMATED WORKER RISK FOR HYPOTHETICAL REMEDIAL ACTION (SLC TAILINGS)

REMEDIAL ACTIVITY	NO. OF FATALITIES	NO. OF INJURIES
1. OCCUPATIONAL RISK		
a. COMMUTING	0.13	5
b. EXCAVATION & LOADING	0.6	52
c. TRANSPORTATION	3.8	7.6
d. TOTAL OCCUPATIONAL	4.5	64.6
2. RADIOLOGICAL RISK		
a. RADON	0.35	-
b. PARTICLE INHALATION	0.35	-
c. WHOLE BODY GAMMA	0.25	-
d. TOTAL RADIOLOGICAL	0.95	-
3. TOTAL WORKER RISK	5.5	>64.6

E. Risk Versus Risk

Table X-5 compares the risk to the public versus the risk to the worker. For a 7-year period of comparison the worker risk is greater than the public risk, assuming restrictions on population growth are enforced adjacent to the site.

The worker risk is dominated by occupational injuries, wherein the risk coefficients are subject to far less uncertainty than the radiological risk coefficients used to estimate both public and worker risks.

On the basis of this analysis, the types of alternative remedial actions should be evaluated such that the risk to the worker population is held to a minimum. It appears that total removal of the tailings from the site is the type of alternative, which will tend to both maximize the risk to the worker population and elevate the radiation doses to the workers and public during the period of remedial action.

TABLE X-5. COMPARISON OF PUBLIC RISK AND WORKER RISK
(PRESENT POPULATION ASSUMED)

PERIOD	PUBLIC HEALTH EFFECTS	WORKER FATALITIES/INJURIES
7 YEARS	3.85	5.5/64.6
15 YEARS	8.25	-

10 CFR Part 40

[Docket No. PRM-40-23]

Sierra Club; Filing of Petition for Rulemaking

AGENCY: Nuclear Regulatory Commission.

ACTION: Publication of Petition for Rulemaking from Sierra Club.

SUMMARY: The Nuclear Regulatory Commission is publishing for public comment a petition for rulemaking filed before the Commission on December 5, 1980, by the Sierra Club. The petition, which has been assigned Docket No. PRM-40-23, requests that the Commission amend its regulation, 10 CFR Part 40, to license the possession of uranium mill tailings at inactive storage sites.

DATE: Comment period expires April 27, 1981.

ADDRESSES: A copy of the petition for rulemaking is available for public inspection in the Commission's Public Document Room, 1717 H Street, NW., Washington, D.C. A copy of the petition may be obtained by writing to the Division of Rules and Records, Office of Administration, U.S. Nuclear Regulatory Commission, D.C. 20555.

All persons who desire to submit written comments concerning the petition for rulemaking should send their comments to the Secretary of the Commission, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, Attention: Docketing and Service Branch.

FOR FURTHER INFORMATION CONTACT: J. M. Felton, Director, Division of Rules and Records, Office of Administration, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, Telephone: 301-492-7211.

SUPPLEMENTARY INFORMATION: The petitioner states "* * * the Commission violated section 81 of the Atomic Energy Act of 1954, as amended, 42 U.S.C. 2111, in that it exempted * * * [uranium mill tailings and inactive storage sites] * * * from licensing as byproduct material without making the express findings required by section 81 that such exemption will not constitute an unreasonable risk * * * to the health and safety of the public." Also, the petitioner states that "* * * such classes or sites of byproduct materials to imperil public health and safety and, accordingly, that no exemption therefor can be justified under the Atomic Energy Act."

The petitioner requests that the Commission grant relief as follows:

(1) The Commission should repeal the purported licensing exemption for the 'inactive' uranium mill tailings sites which are subject to the remedial program of the Department of Energy under the Uranium Mill Tailings Radiation Control Act of 1978, Pub. L. 95-604. This exemption is set forth in the amendments to 10 CFR 40 promulgated by the Commission in 45 FR 65521 (October 3, 1980). This repeal could be accomplished by (a) deleting the last sentence of § 40.1(a) of such regulations; (b) deleting subparagraph (e) of § 40.21; and (c) revising subparagraph (b) of § 40.2a to provide that the Commission will require a license for possession of byproduct material that is located at a site where milling operations are no longer active.

(2) The Commission should further amend section 40.2a of such regulations to provide that the Commission will require a license for possession of byproduct material located on any other real property or improvement thereon which is in the vicinity of the 'inactive' mill tailings sites referred to in (1) above, where such byproduct materials on these vicinity property have been derived from such sites.

(3) Alternatively, the Commission should conduct a rulemaking to determine whether a licensing exemption of such sites or classes of byproduct material, referred to above, will "constitute an unreasonable risk to the health and safety of the public."

Dated at Washington, D.C., this 19th day of February 1981.

For the Nuclear Regulatory Commission.

Samuel J. Chilk,

Secretary of the Commission.

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DEPARTMENT OF THE INTERIOR

National Park Service

36 CFR Part 13

National Park System Units in Alaska; Extension of Comment Period

AGENCY: National Park Service, Interior.

ACTION: Extension of comment period.

SUMMARY: On January 19, 1981 the National Park Service proposed rules for the interim management of National Park System Units in Alaska, 46 FR 3841 et seq. The comment period established in the proposed rules is hereby extended to March 16, 1981.

DATES: The National Park Service will consider all comments on the proposed rule that are received by 5:00 pm (AST), March 16, 1981.

ADDRESSES: Comments should be directed to: Alaska Regional Director, National Park Service, 540 West 5th Avenue, Anchorage, Alaska 99501.

FOR FURTHER INFORMATION CONTACT: John Cook, Alaska Regional Director, National Park Service, 540 West 5th Avenue, Anchorage, Alaska 99501 (907-271-4196).

SUPPLEMENTARY INFORMATION: The January 19, 1981 proposed rules requested that written comments be submitted to the National Park Service by March 5, 1981. This deadline has been extended until March 16, 1981 in order to compensate for some initial delays in disseminating the proposed rules in Alaska.

Dated: February 19, 1981.

Russell E. Dickenson,

Director, National Park Service.

[FR Doc. [illegible] Filed [illegible]]

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Fish and Wildlife Service

50 CFR Part 36

Alaska National Wildlife Refuges; Extension of Comment Period

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Extension of comment period.

SUMMARY: On January 19, 1981 the Fish and Wildlife Service proposed rules for the interim management of Alaska National Wildlife Refuges, 46 FR 5000 et seq. The comment period established in the proposed rules is hereby extended to March 16, 1981.

DATES: The Service will consider all comments on the proposed rule that are received by 5:00 p.m. (AST) March 16, 1981.

ADDRESSES: Comments should be directed to: Alaska Regional Director, U.S. Fish and Wildlife Service, 1011 E. Tudor Road, Anchorage, Alaska 99507.

FOR FURTHER INFORMATION CONTACT: Keith Schreiner, Alaska Regional Director, U.S. Fish and Wildlife Service, 1011 E. Tudor Road, Anchorage, Alaska 99507 (907-276-3800), or William C. Reffalt, Chief, Division of Refuge Management, U.S. Fish and Wildlife Service, Room 2343, U.S. Department of the Interior, Washington, D.C. 20240 (202-343-4791).

SUPPLEMENTARY INFORMATION: The January 19, 1981 proposed rule requested that written comments be submitted to the Fish and Wildlife Service by March 5, 1981. This deadline has been extended until March 16, 1981 in order to compensate for some initial delays in disseminating the proposed rules in Alaska.

Dated: February 20, 1981.

F. Eugene Hester,

Acting Director, U.S. Fish and Wildlife Service.

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Reaganites, with OMB's List in Hand, Take Dead Aim at EPA's Regulations

The Office of Management and Budget has given policy makers an analysis of environmental regulations that calls for sharp cutbacks or even repeal.

BY LAWRENCE MOSHER

When President Reagan unveils his battle plan for the nation's economic rejuvenation on Feb. 18, environmentalists are advised to take cover. One of Reagan's top targets in his regulatory revolution will be the 10-year-old Environmental Protection Agency (EPA).

Over the next decade, according to an analysis prepared by the staff of the Office of Management and Budget (OMB), federal environmental regulations will cost the country some $500 billion more than industry and government would spend if there were no regulations. To avoid this "profound influence on the economy," OMB has proposed sharp curtailment of EPA's regulatory reach through legislative action and deferral or cancellation of pending or existing regulations.

OMB's 44-page analysis of EPA's regulatory activities was made available to *National Journal* along with a list of 242 government-wide regulations singled out for early attention by the Reagan Administration. Of these, 110 were targeted for early action, including 16 administered by EPA. *(See NJ, 1/17/81, p. 94.)*

OMB's analysis makes it clear that the White House budget cutters consider the wide and fast-expanding scope of EPA regulations a primary target for reform. "EPA has a larger number of significant regulations under development than any other executive agency," the document states.

The analysis was prepared by Jim J. Tozzi, deputy administrator of OMB's new office of information and regulatory affairs, and was submitted to James C. Miller III, who heads the office, and to OMB director Dave Stockman. Neither Tozzi nor Miller would comment on the study's role in shaping the Reagan Administration's economic policy.

The analysis, however, appears to fit Stockman's critical view of EPA's growing regulatory impact, which he initially vented in a November memorandum to Reagan's top advisers. In referring to more than a dozen energy, safety and—primarily—environmental laws passed in the past decade, he warned:

"Unless swift, comprehensive and far-reaching regulatory policy corrections are undertaken immediately, an unprecedented, quantum scale-up of the much discussed 'regulatory burden' will occur during the next 18-40 months."

Stockman, in his memo, foresaw more than $100 billion in new environmental, energy and safety compliance costs scheduled for the early 1980s, and decried in particular these new or planned EPA regulations:

- an "unnecessary" carbon monoxide emission limit for 1981 passenger cars of 3.4 grams per mile;
- noise standards for buses and stricter noise limits for trucks;
- cradle-to-grave hazardous waste controls that are a "monument to mindless excess";
- toxic substances controls that threaten to "emulate [the Food and Drug Administration's] 'regulatory lag' for new chemical products";
- new source performance standards for industrial boilers to control sulfur dioxide and nitrogen oxide emissions, which could cost industries up to $2 billion by 1985. (Congress ordered EPA to set federal emission limits for new sources in 1977 to prevent the states from lowering pollution limits to attract new industries.)

OMB COMPLAINTS

OMB's analysis of EPA programs, not unpredictably, mirrors most of Stockman's concerns and goes beyond them in some areas, such as new water pollution rules. *(For a list of the targeted regulations, see box, p. 258.)*

EPA's most serious problems, the document concludes, are "its inadequate legislative authority to consider costs and its lack of oversight and control of growing informational activities."

OMB praised the agency's "disciplined program of policy oversight" for keeping senior managers on top of rule makings. The budget office noted that EPA's formal system of tracking and reviewing regulations served largely as the model for President Carter's March 1978 executive order directing agencies to choose the least burdensome ways of meeting regulatory goals.

That order, which expires in April, is expected to be replaced by a Reagan executive order that will give more explicit directions to federal agencies.

"We're going to be putting down very hard rules for them," Miller said at a meeting of the National Retired Teachers Association and American Association of Retired Persons earlier this month.

OMB's report maintains that EPA has considerable discretion in rule making. Only in setting national ambient air quality standards, it said, must EPA ignore costs. The Clean Air Act would have to be amended to introduce cost-benefit analysis, and the Administration is expected to propose just that this spring when Congress holds reauthorization hearings. Reagan's executive order will cover other EPA rules. *(See NJ, 11/15/80, p. 1927.)*

EPA's impact on the national economy, OMB warns, is now beginning to expand exponentially. The agency's influence goes far beyond its budget, which totals $5.3 billion this fiscal year. Of that, only $1.4 billion represents agency operating costs. The rest of the money subsidizes municipal sewage treatment construction, which is a top candidate for budget trimming because of its potentially inflationary impact. *(See this i[illegible] p. 274.)*

[illegible] agency now has under active consideration some 400 separate rules, which stem from 12 environmental statutes. Some of these regulations are just beginning to implement the more recent laws, such as the 1976 Resource Conservation and Recovery Act, which deals with the transportation and storage of hazardous waste. Others reflect the 1977 amendments to the 1970 Clean Air Act and the 1972 Federal Water Pollution Control Act. *(For a review of the environmental movement, see NJ, 12/13/80, p. 2116.)*

Public and private expenditures for pollution abatement came to $54 billion in 1979, according to the Council on Environmental Quality. That represented 2.3 per cent of the gross national product. About half this spending—$28 billion—was borne by the private sector.

Electric utilities and the auto industry bore the brunt, paying more than 60 per cent of 1979's private pollution control costs. Most of the remainder was paid by the steel, petroleum, chemical and paper industries.

In addition to pollution controls, OMB predicts, the costs of other environmental regu[illegible]ns will "grow dramatically" over the [illegible] few years, although they will not be as large. These involve hazardous waste, toxic substances, pesticides and noise control.

The most significant measurement of EPA's burgeoning regulations, however, is what OMB calls their "incremental cost." These are the pollution control expenditures that go beyond those that would have been incurred in the absence of regulation.

EPA regulations required incremental public and private spending of $35.5 billion in 1979, which represented an 80 per cent increase over 1977's incremental estimate. In 1973, the incremental cost was only $9.4 billion. Cumulatively for the 1980s, these costs could total $500 billion unless some of the regulations are killed or postponed. *(See table, p. 259.)*

"EPA has steadily expanded the number of pollutants and industrial sources that are subject to regulation, and has adopted increasingly stringent control standards," OMB's analysis states. "Air and water pollution abatement still account for the bulk of the agency's regulatory activities, and for the bulk of the cost of complying with environmental regulations."

COSTS AND BENEFITS

In evaluating EPA's regulatory performance, OMB lauded the agency's "economic sophistication," its diligence in improving rule-making procedures and the development of such "innovative techniques" as the "bubble" concept for air pollution control. *(See this issue, p. 287.)* But OMB nevertheless criticized the agency for failing to give sufficient weight to the costs of compliance in some of its more recent regulatory actions. It cited these examples:

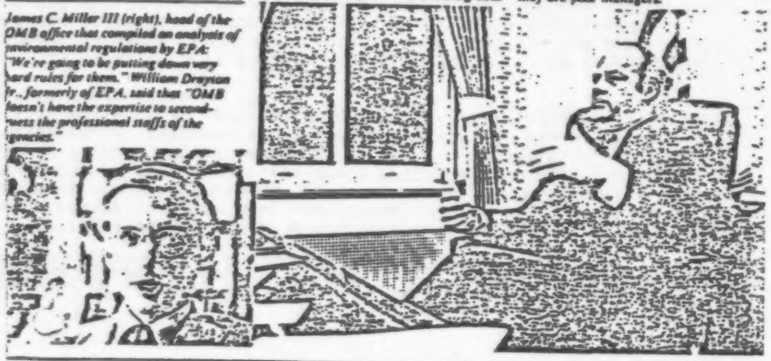
- Revisions of ambient air quality standards for nitrogen oxides and carbon monoxide that affect primarily the auto industry and retain "excessively stringent standards."
- Revision of the effluent guidelines for non-toxic water pollutants affecting both the paper and steel industries that have "overinflated" the "cost reasonableness" standard ordered by Congress in 1977. EPA has adopted a standard that it says would cost industry $1.15 a pound based on the cost experience of municipal sewage treatment plants. But the paper industry and OMB argue that a reasonable standard should cost closer to 40 cents a pound. The difference is "several billion dollars," OMB asserts.
- Hazardous waste treatment and disposal regulations that did not even attempt to apply cost considerations Carter ordered in 1978. OMB challenges EPA's contention that the Resource Conservation and Recovery Act prohibits compliance cost considerations.
- Visibility rules and prevention of significant deterioration (PSD) provisions to protect the "clean air" areas of the country that are "so vague and procedurally complex that EPA has been unable to assess their economic impact."

OMB's new attempt to apply cost-benefit analysis to every aspect of environmental regulation alarms William Drayton Jr., former assistant EPA administrator for planning and management. Drayton was known as "the guru of regulatory reform" in the Carter Administration, and it was largely the regulatory and budgetary management procedures he instituted at EPA that OMB praised in its recent analysis.

"I see the new Administration careening in a direction that will be counterproductive to what President Reagan really wants—sensible regulatory reform," Drayton said in an interview. "What is now happening suggests a period where OMB will have very high influence, and that's too bad because they are poor managers.

"Jim Tozzi sees OMB as in competition with the [U.S.] Regulatory C[illegible]. But OMB doesn't have the expertise to second-guess the professional staffs of the agencies. The Regulatory Council is a good vehicle for reform because it complements rather than threatens."

But, Drayton added, "OMB's often insulting attitude produces poor reactions in the agencies. This sets up a destructive conflict pattern that creates defensive game-playing rather than responsible conduct. Regulators want to do a good job, too."



James C. Miller III (right), head of the OMB office that compiled an analysis of environmental regulations by EPA: "We're going to be putting down very hard rules for them." William Drayton Jr., formerly of EPA, said that "OMB doesn't have the expertise to second-guess the professional staffs of the agencies."

OMB Has Its Eyes on These Regulations

Following are Environmental Protection Agency regulations that the Office of Management and Budget is reviewing [illegible] either deferral or rescission. Rules marked with an asterisk (*) have been specially targeted by OMB. Regulatory costs marked with a dagger (†) are annual.

Regulation	Cost	Affected industry
AIR		
*Nitrogen dioxide emissions for 1985 trucks	$4 billion over five years	auto
Particulate emissions for 1985 heavy diesel trucks	$690 million over five years	auto
Evaporative emissions for 1985 heavy trucks	$10 million	auto
*1984 high altitude standards	$660 million over five years	auto
Fuels and fuel additives	$35 million†	auto
*New source performance standards for industrial boilers	$1 to $2 billion	many
Airborne carcinogens	$1 to $2 billion	steel, chemical
*Benzene rules	?	chemical
*Prevention of significant deterioration expansion to new pollutants	$1 to $2 billion	electric utilities, steel and petroleum
*Ambient air quality standards for ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide and particulates	$16 billion†	auto, electric utilities
*Excursion policies for ambient standards	$1 to $2 billion	auto, electric utilities
*Carbon monoxide waivers for cars	$300 million	auto
Nitrogen dioxide waivers for diesel cars	?	auto
Particulate emissions for 1982 diesel cars and small trucks	$1 to $2 billion	auto
1981 high altitude standards	$10 million	auto
1984 emission standards for light trucks	$1.3 billion over five years	auto
1984 emission standards for heavy trucks	$2.6 billion over five years	auto
Testing, labeling and warranty	$100 million	auto
*New source performance standards for electric utilities; prevention of significant deterioration rules for particulates and sulfur dioxide; visibility rules for national parks	$6 billion by 1988	electric utilities, petroleum and mining
WATER		
[illegible]luent guidelines for electric utilities	$200 million	electric utilities
*Effluent guidelines for pulp and paper	$900 million	paper
*Effluent guidelines for iron and steel	$600 million	steel
Organic chemicals in drinking water	$1 billion over three years	public water systems
*Pretreatment standards for discharges to municipal sewage treatment plants	?	electroplating, textiles and leather tanning
HAZARDOUS WASTE		
*Disposal regulations	$15 billion over 10 years	many
Superfund regulations for cleanup	?	many
TOXIC SUBSTANCES AND PESTICIDES		
Test rules for chloromethane and chlorinated benzenes	?	chemical
*Premanufacture notification	$10 million	chemical
Chlorofluorocarbons production limits	$450 million	chemical
Pesticide registration guidelines	$150 million†	chemical
NOISE		
*Emission standards for buses	$70 million	auto
*Emission standards for railroads	?	railroad
*Emission standards for trucks	$100 million†	auto
*Emission standards for garbage trucks	$30 million†	auto
*Emission standards for motorcycles	$10 million†	motorcycle
RADIATION		
Disposal of radioactive wastes	$800 million†	nuclear power and defense

Ford, Bacon & Davis Utah Inc.
ENGINEERS - CONSTRUCTORS

April 13, 1981

COMMENTS ON EPA DEIS FOR REMEDIAL ACTION STANDARDS FOR INACTIVE URANIUM PROCESSING SITES (40CFR192) WORKING LEVEL STANDARD

Data given in Chapter 7 indicate that 10 percent to 20 percent of buildings in areas that experience cold weather, have radon daughter concentrations (RDC) greater than 0.015 WL (Working Levels). Thus, one in five structures where tailings have been identified is likely to have RDC in excess of 0.015 WL. In addition, as more energy saving measures are taken in residences, the proportion of residences with RDC greater than 0.015 WL will increase to perhaps one in every three.

It is also shown in Chapter 7 that 60 of 217 residences and schools in Grand Junction, Colorado, have been treated but not yet brought below the action level of 0.01 WL above background (~0.007 WL) or a total of 0.017 WL. This level appears to be too low for practical remedial action procedures or the results may indicate that these structures would have had higher than normal WL in the absence of tailings because of their construction and materials, and further attempts at reductions would be futile.

The action level should be set at the upper end of the range of normal background levels, such as 0.02 WL, since values above that level indicate an anomaly probably due to tailings if they have been found on the property. This 0.02 WL remedial action level should be applicable only to residences and to schools or structures where employees spend significantly more time than the normal 40 hour week.

In businesses, a higher WL level should be allowed since employees would be exposed to the higher levels about one quarter of a year (2080 hrs/8760 hr = 0.24). A working level limit of 0.02 WL to 0.04 WL is proposed. This leads to one-tenth of the acceptable annual integrated WL exposure allowed for miners. Business exposures would be primarily experienced by individuals of employable age with only insignificant exposure to children, the aged, and the infirm.

Cleanup of Open Lands

There is a difference of opinion in the remedial action community as to whether or not the standard of 5 pCi/g of radium in soil includes background radium or not. The wording in the proposed standards is very clear that the "average concentration of radium-226 attributable to residual radioactive material from any designated processing site... shall not exceed 5 pCi/g." Radium occurring naturally in soil beneath tailings did not come from a processing site. The excess radium in contaminated soil results from five tailings particles mixing with the soil or from the adsorption of leached radium on soil particles beneath the tailings. In both cases, the additional residual radium in the soil after cleanup, came from the processing site, and therefore the final level should be stated as 5 pCi/g of radium plus the natural background radium concentration in the soil. The standard is incorrectly referred to in Section 8.2.

The EPA also states that the standard applies to any 5 cm or 15 cm thickness of soil depending upon the depth of the sample. If one reads this literally, no single spot could exceed 5 pCi/g of radium. No area averaging is permitted. This leads to excessive monitoring and sampling.

The average concentration of radium from a processing site must not exceed 5 pCi/g of radium in any 5 cm thickness within one foot of the surface. In many cases, large windblown areas exceed this standard. If the contamination were averaged in 15 cm, large areas of fragile desert would not require decontamination by scraping and removing all vegetation along with the soil. This decontamination results in a significant environmental impact. Where homes and businesses are located in the windblown areas, lawns and shrubbery must be removed. Such contamination will eventually migrate downward about one foot into the soil from precipitation or irrigation.

The DOE has calculated that contamination of 5 pCi/g of radium in soil to an infinite depth (actually about 15 ft.) beneath a structure could result in RDC of 0.02 WL. However, no such contamination profile exists. The radon flux from a thin layer of contaminated soil at 10 pCi/g decreasing to background within a depth of two feet would have a lower flux than the 5 pCi/g infinite depth case. Contrary to the DEIS, an increase in the standard by a factor of two to 10 pCi/g could save many millions of dollars in excavation and haulage costs. One additional foot of excavation at the Vitro site in Salt Lake City and transport of the contaminated soil to the disposal site would cost more than one million dollars.

A standard should be set that does not somehow require implementation to achieve even lower levels (ALARA). Just because it would be easy to remove one additional foot of soil, it is not reasonable to do so if the cost benefit far exceeds the cost of protection in other industries. The cost/benefit/ratios are exceedingly high for the mill tailings program based upon the standards. To require more extensive remedial action worsens the cost benefit ratio

COMMENTS ON EPA DEIS FOR REMEDIAL ACTION STANDARDS FOR INACTIVE URANIUM PROCESSING SITES (40CFR192) STANDARD FOR CLEANUP OF CONTAMINATED OPEN LANDS.

The environmental standards proposed by the EPA for cleanup of open lands contaminated with radioactive materials from inactive uranium processing sites potentially contradict proposed standards for disposal of inactive uranium mill tailings and do not allow, in their present form, for the exercise of good judgement. These problems are discussed below.

The Contradiction

The cleanup standards, on one hand, require that contaminated open lands must be cleanud up such that the average radium-226 concentration attributable to residual radioactive material in various thicknesses of soil does not exceed 5 pCi/g. On the other hand, if the tailings and contaminated material were disposed of, essentially in place, the average annual release of radon-222 from the disposal site to the atmosphere by residual radioactive materials (assumed to be that in excess of naturally-occurring amounts of radium-226) may not exceed 2 pCi/m^2-s.

From Figure 1 it can be seen that a 15-cm thickness of tailings or contaminated material which is covered by slightly more than 1 m of dry soil and whose radium-226 concentration is about 50 pCi/g will produce a flux at the surface of about 2 pCi/m^2-s. Suppose then that contamination extends to 1 m below the intended final grade and the average radium-226 concentration attributable to residual radioactive material at 1 m below the final grade is 5 pCi/g, as required by the proposed cleanup standards. The radon-222 flux at the final grade which would result from a 15-cm thickness of such contaminated soil at the 1-m depth would be about 0.2 pCi/m^2-s. Thus the proposed cleanup standard under likely conditions may be much more restrictive than the proposed disposal standard, in terms of release of radon-222 to the atmosphere. That is to say, whereas the proposed disposal standard allows radon-222 release to the atmosphere which is considered acceptably low in terms of risk to the public, the proposed cleanup standard for contaminated open lands under likely conditions would potentially require a radon-222 release rate 10 times smaller. Finally, the question is raised, "If the risk to the public is acceptably low for disposal of tailings and contaminated material, why should the contaminated material be cleaned up to standards which may be 10 times more restrictive?"

This contradiction between the proposed disposal standards and the proposed standards for cleanup of contaminated open lands should be resolved by relaxing the cleanup standards for contaminated open lands.

The Exercise of Good Judgement

A comparative cost-benefit evaluation provides a quantitative tool for the exercise of good judgement and demonstrates that relaxing the cleanup standard for open lands is the prudent thing to do.

If the costs and benefits (in terms of public health) of cleaning up contaminated open lands are evaluated, a basis for the exercise of good judgement can be developed. As an illustration, the costs and

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benefits of removing 15 cm of contaminated soil (or tailings) under various conditions, as well as the resulting benefits, were estimated for a 100-m^2 area at the Vitro site in Salt Lake City. The cost-benefit ratio is presented in Figure 2 as a function of depth below final grade, with radium concentration as a parameter.

The note on Figure 2 shows that removal of 15 cm of typical tailings (600 pCi/g of radium-226) from 100 m^2 of the present surface has a cost-benefit ratio of about $73,000 per health effect (case of lung cancer) avoided. This suggests that removal of the top 15 cm of tailings is a very cost-effective undertaking, when measured in terms of health effects avoided. By contrast however, the cost-benefit ratio of removing 15 cm of contaminated soil with a radium-226 concentration of 10 pCi/g at a depth of 1 m below final grade is a startling $9,000,000 per health effect avoided, or more than 100 times less cost-effective.

Continuing the illustration, imagine that excavation during cleanup had extended to a depth which was 1 m below the intended final grade, and the radium-226 concentration was found to be 10 pCi/g in the next 15 cm of soil. Also allow that the naturally-occurring radium-226 in soil of the general vicinity is known to range from 2 to 3 pCi/g. The answer to the question of whether to remove an additional 15 cm of contaminated soil at that depth is suggested by reference to Figure 2. Since the return is so small compared to the additional investment required ($9,000,000 per health effect avoided), the judgement is made that decontamination is complete, even though the radium-226 attributable to residual radioactive material is in excess of the presently proposed standard by as much as 3 pCi/g. Even under these conditions, the radon-222 released to the atmosphere will not exceed 0.5 pCi/m^2-s -- which is well below that allowed if the contaminated material were disposed of at that location.

Conclusion

Because of the potential contradiction between the proposed standard for cleanup of contaminated open lands and the proposed standard for tailings disposal, and because of the need for common sense, allowing for the exercise of good judgement during decontamination, the standards for cleanup of contaminated open lands should be relaxed. The concept depicted in Figure 2 forms a rational basis for a quantitative tool to be used in such exercise of good judgement.

Ford, Bacon & Davis Utah Inc.

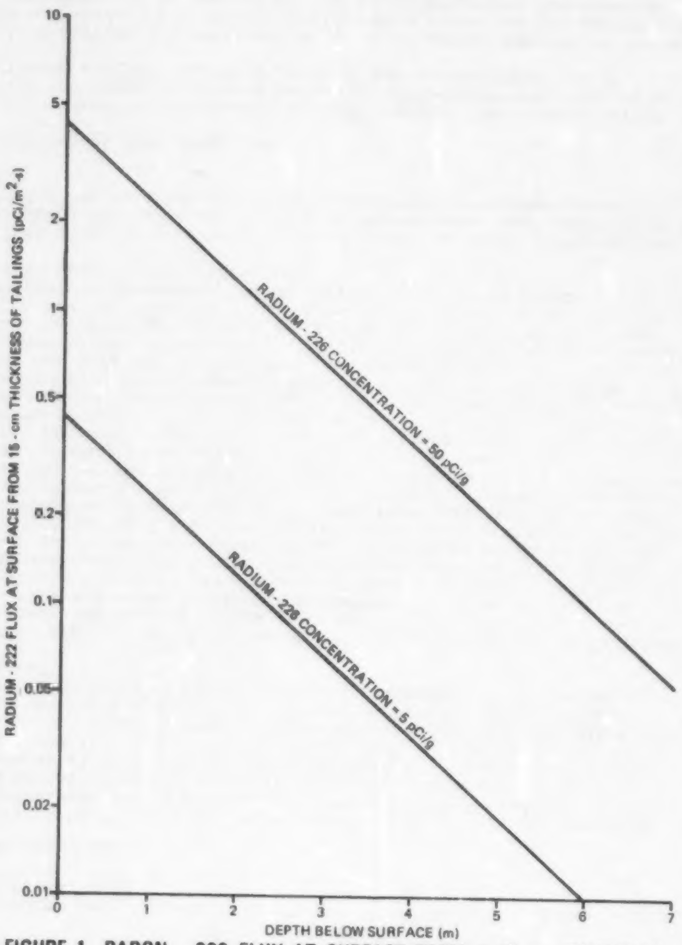
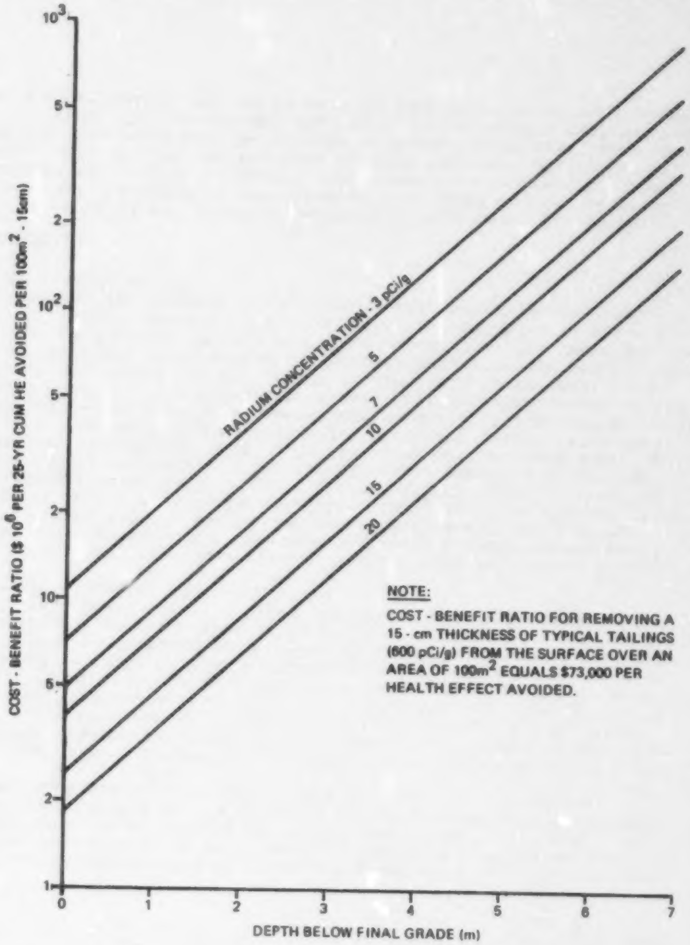


FIGURE 1 RADON - 222 FLUX AT SURFACE FROM A 15-cm THICKNESS OF TAILINGS VERSUS DEPTH BELOW SURFACE

Ford, Bacon & Davis Utah Inc.



NOTE:

COST - BENEFIT RATIO FOR REMOVING A 15 - cm THICKNESS OF TYPICAL TAILINGS (600 pCi/g) FROM THE SURFACE OVER AN AREA OF 100m^2 EQUALS $73,000 PER HEALTH EFFECT AVOIDED.

FIGURE 2 COST - BENEFIT RATIO VERSUS DEPTH BELOW FINAL GRADE

Ford, Bacon & Davis Utah Inc.

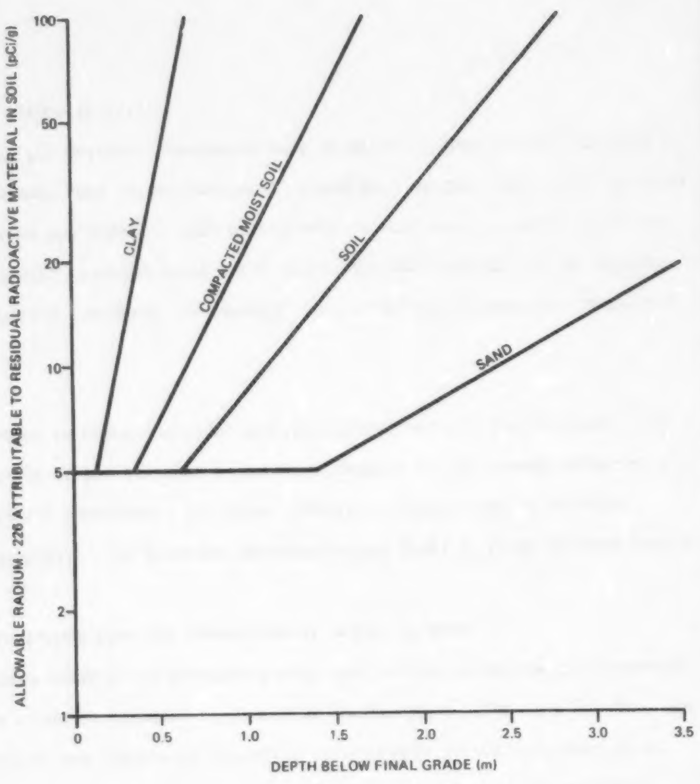


FIGURE 3 POSSIBLE STANDARD FOR CLEANUP OF RADIUM - 226 IN OPEN LANDS

STATEMENT FOR EPA HEARINGS - APRIL 24, 1981

My name is Alvin E. Rickers. I am the Director of the Division of Environmental Health of the Utah State Department of Health. I will comment on the proposed standards for uranium mill tailings.

The EPA proposed standards for clean-up and disposal of uranium mill tailings included in the EIS have been ~~set~~ proposed too close to the levels encountered in nature. The standards will require much additional expense in the clean-up of small residual amounts of tailings both at off-site properties and on the mill site. This expense is not justified by a corresponding health benefit. The standard must be set to protect the public health with a margin of safety. The question is, "How much of a margin?"

The public looks at official limits set by health related agencies as a demarcation between safe and unsafe conditions. Very little is known about the risks involved at the low levels represented by these proposed standards and for this reason a linear non-threshold response theory has been used as a conservative method to estimate risk by extrapolation from higher doses.

As public health officials, we are obligated to protect the public from harmful effects within reason and, in the area of the unknown, we take a conservative position. However, a conservative position does not imply the elimination of all risk.

The 1976 Phase II Engineering Assessment of the Vitro Site by Ford, Bacon, and Davis estimated that 11 health effects would occur in 25 years within one-half mile of the Vitro site with no remedial action and no building ban. When the tailings are removed along with contaminated sub-soil, the difference in health effects will be insignificant if we use a clean-up standard of 15 pCi/gm radium-226 instead of 5 pCi/gm. The standard seems to be directed toward restoration of natural environmental levels rather than the prevention of health effects.

Similarly, the proposed remedial action level of 0.015 Working Levels (including background) for radon daughter contamination of occupied buildings is too low when at least 10 percent of the normal houses with basements in Grand Junction, New York State, and New Jersey exceed this level.

Setting standards for remedial action, which are near the conditions encountered normally where there is no tailings problem, has an adverse effect on the public. Many people will be worried that their homes are unsafe when this is not the case. Since many of the public still look to the EPA for guidance concerning what is safe and what is not, you have a grave responsibility.

I propose as an alternate standard the following:

1. Revise Part 192.21 Table B to read

   Average Annual Indoor Radon Decay
   Product Concentration - above background - Background to be the average of at least 50 well dispersed first floor measurements in non-basement residences within 10 miles of the tailings pile but at least 1 mile from any known tailings locations.
   (WL) 0.015
   Indoor Gamma Radiation -
   above background (milliroentgen/hour) .05

2. Review Part 192.12 to change all references of 5 pCi/gm to 15 pCi/gm.

Alternative standards would provide the following advantages:

1. The number of radon related health effects would not be significantly increased and this would avoid difficulities involved in areas of high background.

2. The number of gamma related health effects would still be less than those related to radon.

3. No significant amount of radioactivity would be left at the location from which tailings is removed.

4. The standards would be more closely related to health effects and not add so much to the public over-reaction to radiation risks.

5. The cost of the remedial action would be significantly decreased.

CW

415

April 25, 1981

TO: Officials of the U.S. Environmental Protection Agency (E.P.A.)

FROM:
Stanley T. Holmes III
278 'D' Street - #3
Salt Lake City, UT 84103

SUBJECT: Comments to hearing on disposition of residual radioactive materials.

Thank you for allowing me the opportunity to have input into this segment of the nuclear energy/weapons decision-making process. If our society is going to persist with its prolifefation of nuclear energy and weapons development, then we will be constantly forced to deal with issues attendant to radioactive materials processing.

I have a few questions and comments to present to you.

First of all, I would like to know how safe, or dangerous, uranium mill tailings really are. In April, 1979, as a student at the University of Utah, I set out to do research on the locations of tailings from the old Vitro processing plant, here in Salt Lake City. I also wanted to ascertain what danger those tailings presented to the residents of Salt Lake County.

In my pursuit of information, I incurred some obstacles, and had to do a bit of unnecessary running around. Officials of the Radiation and Occupational Health section of the Utah Division of Environmental Health, who did not understand my concern, told me that they did not have the information I sought. I was referred to the consulting firm of Ford, Bacon and Davis Utah for information on tailings locations. At Ford, Bacon and Davis Utah, who did the Vitro analysis for the U.S. Energy Research and Development Administration (E.R.D.A.), I was told to wait while Dr. Vern Rogers checked with Grand Junction (Colorado) for clearance to grant my information request. According to Dr. Rogers, Grand Junction said "no", but he added that Larry Anderson and the folks at Environmental Health did have the information I wanted. Back, again, to the Radiation and Occupational Health office, where Mr. Blaine Howard did give me several reports from which I finally extracted tailings addresses. When I asked whether any residences or businesses existed at those sites, I was told that since there was no danger from the tailings, they wouldn't cause unnecessary problems for those living, or working, over the tailings by giving me that information. I had to do my own field survey to get that info. ((Attachments #1 and #2 are, respectively, copies of a report I made to the Daily Utah Chronicle and an article the Chronicle ran on the story.))

Since that time, Utah officials have admitted that there are enough grounds for concern to evacuate one Salt Lake fire station, which was built atop the tailings.

Residents of Salt Lake County, and all Americans, deserve to know exactly what the dangers are from tailings, and from tailings in aggregate with other natural and man-made radiation sources.

Second; given Energy Secretary Edwards seeming preference for a future increasingly reliant upon nuclear energy and nuclear weapons, how much more residual radioactive material will be generated between now and the year 2000? With the proposed reactivation of weapons-related plutonium reactors, and stepped-up NRC commercial reactor licensing in the offing, what provisions have been made to address the exacerbation of problems we haven't yet managed to solve?

Thirdly; I am glad to see you folks (the E.P.A.) conducting these hearings. If it were left up to Vitro Corporation --which is still turning government profits in places as far afield as Oxnard, California and Bath, Maine-- these problems would not be addressed.

Lastly; my solution for clean-up and disposal of the existing tailings is to put them back into the mines from which they were taken.

I also belive that the problems we now face --and worse-- can be precluded, in the future, by the United States' throttling back on all but medical uses of nuclear energy.

Stanley T. Holmes III

PAGE 1 OF 3

ATTACHMENT #1

In April, 1976, the Salt Lake City consulting firm of Ford Bacon and Davis Utah, Inc. provided the U.S. Energy Research and Development Administration, Grand Junction, Co., with a report entitled "Phase II - Title I: Engineering Assessment of Inactive Uranium Mill Tailings" Included in the report, which addresses various problems associated with the Vitro tailings, is a list of seventeen locations, in Salt Lake City, which appears under the heading "Structures and Lots Assumed to Require Remedial Action." "Remedial Action", here, means removal of the radioactive tailings from under, or near, those structures and lots. Ford Bacon and Davis Utah consultants had concluded that radioactive emanations at the seventeen sites exceeded safe levels; and they estimated that it would cost $296,200 to remove the tailings from those sites.

Since the sites were identified, in the Ford Bacon and Davis Utah report, by their National Environmental Research Center (NERC) code numbers only, it was necessary for me to refer to a 1973 NERC report, compiled with the assistance of the Atomic Energy Commission (AEC)---now the Nuclear Regulatory Commission (NRC)---and the Environmental Protection Agency (EPA), in order to find out the exact locations of the tailings sites. I found the NERC report, entitled "Community Summary Report for Radiation Surveys: Salt Lake City, Utah", to contain scores of "Indoor Radon Study - Gamma Screening Forms"---one for each site examined for excessive radioactivity. An examination of 39,301 structures in Salt Lake Valley, during the initial survey, resulted in 272 reports of gamma radiation anomalies. According to the Summary Report, "An anomaly is defined as any location where the recorded counts per second (c/s) exceeded the determined background c/s for the location by 50 or more c/s."

Anyone interested in researching the reports for more information will find copies of both at the Radiation and Occupational Health section of the Utah State Environmental Health Services (at 150 West N. Temple, SLC). Be prepared for some resistance, though, as some personnel there would rather that you, the "general public", were not aware of the exact locations of the tailings. Government employees explained to me that since the radioactivity being emitted by the tailings is not really dangerous, it would be unfair to publicize the names and addresses of businesses operating on, or near, tailings material. Keep in mind, however, that our government is not above misinforming, or deceiving, the public about certain issues. The people of St. George were led to believe that no real danger existed, for them, from the Nevada nuclear tests. I, for one, do not trust the government to be candid with me about all matters which may have an adverse effect on my life. Besides, costs of the NERC and Ford Bacon and Davis Utah, Inc. surveys were ultimately borne by we, the taxpayers, who have been sheltered from the findings. As regards nuclear effluents, I would feel much better knowing that I do not live on, or near, the sites where radioactive wastes have been deposited, and that I am not consuming any commodity which has been processed or stored on, or near, such sites.

The following list of the seventeen tailings locations, assumed by Ford Bacon and Davis Utah to require remedial action, includes each site's code number, address, and owner --- as they appear in the NERC report:

#423[illegible]4	3700 S. Main St.	SLC Fire Dept.
#42528	2583 S. 800 E.	J. L. Brunswick
#42321	3339 S. 900 W.	S. Cornell
#42356	661 W. 3300 S.	name not given
#42472	3687 S. 2740 W.	J. A. Carter
#42330	3195 S. 900 W.	Won Door Corp.
#42329	3215 S. 900 W.	Won Door Corp.
#42408	184 W. 3300 S.	Kohler Plumbing Supply
#42363	1101 S. 700 W.	Koldaire
#42311	3585 S. 500 W.	A & R Meats
#42296	2545 S. 300 W.	*see note*
#42999	adjacent to #42296	*see note*
#42998	adjacent to #42999	*see note*
#42319	3432 S. 900 W.	N. Norman
#42413	3007 S. State St.	Millstream Trailer Park
#42412	3040 S. State St.	Holiday Inn
#42396	3365 S. 300 W.	Boyers Food Products

*note: At the time of the NERC survey, #42296 was a vacant lot, owned by the U.S. Government. Sites #42999 and #42998 were identified after the 1973 NERC report, and are close to #42296. One State employee, who helped take measurements of radioactivity in the area of the three sites, confirmed that R & W Dairy Products Co. (2575 S. 300 W.) is on, or near, tailings.

SUBMITTED BY:
STAN HOLMES III
MEMBER,
BRINE SHRIMP ALLIAN

H-4

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Energy Systems Group
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Telephone: (213) 341-1000
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Rockwell International

April 9, 1981

In reply refer to 81ESG-3426

Director, Criteria and Standards Division (ANR-460)
Office of Radiation Programs
U. S. Environmental Protection Agency
Washington, D.C. 20460

Gentlemen:

Subject: Public Hearings on 40 CFR Part 192 (Proposed)

The Federal Register of March 12, 1981 announced that public hearings would be held on the proposed 40 CFR Part 192, Remedial Action Standards for Inactive Uranium Processing Sites." It was stated that members of the public may suggest questions for the presiding officer to ask of speakers. After reviewing the Draft Environmental Impact Statement (EPA 570/4-80-011) we have several questions that we feel should be clarified at the public hearings. These are:

1. The DEIS in Chapter 4 provides estimates of number of fatal lung cancers which may result from exposure to radon decay products from the tailings piles. (a) What would be the expected number of lung cancer fatalities in the same population group due to all causes? (b) How many of these fatalities are estimated to be due to smoking?

2. Chapter 4 of the DEIS assumes a linear risk associated with radiation health effects with no damage threshold, but assumes a threshold for non-radioactive toxic materials. What would be the effect on the conclusions reached if a damage threshold were assumed for radiation health effects?

3. Chapter 6 discusses occupational hazards associated with the remedial actions. What is the estimated number of construction and traffic fatalities as compared with the number of cancer deaths avoided?

We feel that these questions should be addressed at each of the public hearings to help provide a better perspective of the impact of the proposed remedial actions which will result from this rulemaking.

Very truly yours

W. D. Kittinger

W. D. Kittinger
Program Manager
Decommissioning

RECEIVED
CRITERIA & STANDARDS DIVISION, ORP.
DATE: APR 20 1981

H-7

PRESENTATION

EPA Hearings in Durango, Colorado

on

Standards for the UMTRAP

by

Albert J. Hazle

Colorado has long been concerned with the disposal of uranium mill tailings. Since the early 1960's studies have been conducted with the cooperation of others to determine the impacts from inadequately stabilized tailings piles. Finally in 1972, mill tailings were recognized by Congress as having a significant potential impact. This was the passage of PL 92-304 providing for the Grand Junction Remedial Action Program on buildings where tailings were used. Continued effort by the states and EPA resulted in Congressional action in 1978 with the enactment of PL 95-604 authorizing the inactive tailings pile remedial program and providing for strengthening of the NRC and Agreement State programs to preclude another generation of inadequately reclaimed and stabilized tailings piles.

Within this state there are 9 inactive uranium mill piles at 7 general locations with a total of 11 million tons of tailings. There are approximately 7,000 off-site or vicinity locations contaminated by these 9 piles. Another 16 million tons of uranium mill tailings or residues do not fall under the remedial program addressed by Title I of PL 95-604. Proposed or new mills yet to come on-line will generate an additional equivalent inventory; however they will be handled right from the start in a more fitting manner commensurate with their long-term potential hazard.

Colorado's comments are predicated on the fact that there must be consistency in the criteria and standards of EPA, NRC, DOE, and the States', and that among these entities there must be continued consistency between the regulations and interpretations implementing these standards and criteria.

Some specific comments regarding 40 CFR 192 as proposed are:

Subpart A.

192.03

a) EPA proposes a minimum of one thousand years where NRC requires a longevity standard of "thousands of years". The practicality of the matter is that the proposed EPA value would be appropriate if the protection parameters would not change over the thousand years. However, in a slight erosional environment, depending and the reclamation site, periods of thousands of years must be considered due to the peculiarities and erosional potentials of the specific site. The specificity of one thousand years is as inappropriate as is the concept of using geological time.

b) The application of drinking water standards to ground or surface waters is problematic. Values for surface waters of Colorado generally vary from ~ 10 pCi Uranium/liter in the higher elevations to equal to or greater than 100 pCi Uranium filter in the lower reaches of major river basins. This is primarily due to the solids content of the water. In Colorado, the alpha radioactivity of these solids range from 20 to 40 pCi/gram statewide. Radium values range from less than 0.1 pCi/liter to over 400 pCi/liter in groundwaters. These are not man-enhanced situations. The value for radium in drinking water was based on health impact and the ability to treat elevated levels. The value for uranium was based solely on health impact. Ability to treat waters with any degree of efficiency for uranium removal is questioned. I envision extensive usage of the exemptions proposed in Part C to "accomplish" any form of remedial action thereby identifying that the standards were improperly formulated as to efficacy of attainment and enforcement.

c) If a river was within the prescribed measurement distance (0.1 kilometer), a site could have significant leaching but still be within the standard due to the dilution by the river's influence on the unconfined aquifer. The use of two different measurement distances has an economic basis, however, it is questioned if the health impact might play a more important role. Further, the criteria should be identical to that applied to active sites as the hazard is identical.

Subpart B

192.12

a) Under (a) no guidance is provided for DOE's "reasonable assurance" in the implementation of these standards. Additionally, there is no interpretation on how the values are to be measured. Colorado has gained a great deal of experience in the implementation of the Grand Junction program. We forsee problems in the varied interpretations that have and will occur in the future on the proper and consistent measurement procedures.

b) Under (c) the term "dose equivalent" is used and references (a) and (b). However the maximum dose equivalent in rem as defined is not included in Table B.

Part C

a) The exemptions provided in 192.20 and 192.21 are consistent with the practices in Grand Junction, which relates solely to the gamma and radon daughter values. As such we envision their proper limited usage. However, with regard to the other values, as stated before, we envision extensive use of the exemptions which indicates that the standards were improperly derived.

Again, let me express concern for consistency between agencies on standards and their implementation. What I might be more concerned with is how DOE intends to implement these standards. When will their implementing regulations be available for review and comment?

I anticipate that the Department's Water Quality Control Division and the Colorado Department of Natural Resources will provide comments on the proposed standards eith at your hearings or by letter during the continued comment period.

Thank you for the opportunity to present testimony before the panel. We will be providing these comments in writing also within the comment period. If there are any questions that you might have, I would be most happy to respond.

Thank you.

STATE OF COLORADO RICHARD D. LAMM, Governor
DEPARTMENT OF NATURAL RESOURCES
D. MONTE PASCOE, Executive Director
1313 Sherman St., Room 718, Denver, Colorado 80203 866-3311

Board of Land Commissioners
Division of Administration
Division of Mines
Division of Parks & Outdoor Recreation
Division of Water Resources
Division of Wildlife
Geological Survey
Oil and Gas Conservation Commission
Soil Conservation Board
Water Conservation Board
Mined Land Reclamation

Dr. William A. Mills, Director
Criteria and Standards Division
Office of Radiation Programs
U.S. Environmental Protection Agency
Washington, D.C. 20460

April 22, 1981

Dear Dr. Mills:

The Colorado Department of Natural Resources has reviewed the Draft Environmental Impact Statement for Remedial Action Standards for Inactive Uranium Processing Sites (40 CFR 192). We would like to specifically address Section 8.1.5, titled Period of Application of Disposal Standards. In this Section, the EPA states that "We believe that one thousand years meets the Congressional criterion that 'the remedial action must be done right the first time.'" The Colorado Department of Natural Resources would like to point out that this statement is in direct conflict with the Nuclear Regulatory Commission's uranium mill licensing requirement that tailings disposal be effective for "thousands of years." The NRC states that "In selecting among alternative tailings disposal sites or judging the adequacy of existing sites, consideration should be given to specific site characteristics which will assure meeting the broad objective of isolating tailings and associated contaminants from humans and the environment without ongoing active maintenance for thousands of years."

The Colorado Department of Natural Resources has been involved in the review and analysis of disposal sites for uranium tailings throughout Colorado. Contrary to the opinion expressed in Section 8.1.5, we feel that tailings standards for periods as long as 10,000 years are practical and can be economically achieved. The study of geology, specifically Quaternary geology, geomorphology, and engineering geology, can effectively analyze the long-term stability of disposal sites. A stable repository can satisfy the NRC criterion of "thousands of years," if geologic conditions and processes are

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Dr. William A. Mills, Director
Page 2
April 22, 1981

carefully analyzed. To insure that geologic conditions are fully analyzed, we recommend that the U.S. Nuclear Regulatory Commission siting criteria be adopted and incorporated into the EPA impact statement.

In summary, we feel that the 1,000-year standard proposed by the EPA does not adequately protect future generations and thus does not meet the Congressional criterion. Because geologic conditions have been and can be used to determine the long-term stability of uranium tailings repositories, we recommend a minimum disposal requirement of at least "thousands of years" be adopted and that the U.S. NRC siting criteria be incorporated and discussed in the EPA Environmental Impact Statement.

Sincerely,

D. Monte Pascoe, Director
Colorado Department of Natural Resources

gp

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My name is K.T. Scott, I am Chairman of the Board of the La Plata County Commissioners. I am not a geologist, so I will not use a lot of the terms used by them, but simply use the common sense approach.

The La Plata County Commissioners are pleased to have this opportunity to testify at this EPA hearing with respect to proposed standards for the cleanup and disposal of uranium mill tailings at inactive mill sites. Our comments are as follows:

1. The standards should be sufficiently realistic and flexible so that the Department of Energy can proceed forthwith the remedial actions authoried by Title 1 of PL 95-604.

2. The standards should be reasonably achievable at reasonable costs.

3. The standards for allowable emissions at disposal sites should be set in such a manner that the diversity of radon emission rates of potential burial and cover materials is recognized.

4. The standards for clean-up of inactive mill sites should be formulated with recognition of the fact that parts of the Durango tailings are presently situated on slag materials from previous base metal smelting operations. A local geologist has reported that these slag materials are slightly radioactive. Thus, the proposed standard of 5 pCi/gm of radium-226 attributable to residual radioactive material should be examined in the light of this special circumstance.

Likewise, the natural soils in the vicinity of the raffinate ponds immediately South from the Durango mill site are reported to contain quantities of radioactive materials in excess of average soils. Here again, we urge you to examine carefully, the special problems inherent in the raffinate ponds area where relatively small quantities of raffinate residue are mixed with natural soils.

5. The proposed standards relative to surface and underground waters, require drinking water quality or zero increase in the concentration of contaminants within .1 kilometer of the disposal site. This concern for safe drinking water is shared by the Commission. However, we urge that these proposed standards be re-evaluated in the light of engineering cost estimates and the very remote possibility of contamination of aquifers which are presently or may in the future be a source of drinking water.

One of the sites under consideration by the DOE for disposal of the Durango tailings is Bodo Canyon. We recommend that the standards for the protection of ground and surface waters be sufficiently flexible so that other factors such as costs, convenience, dangers of highway transport, etc. can be considered in the evaluation of acceptable burial sites.

6. In summary, the Commissioners and the citizens of La Plata County are most anxious that remedial actions be done in a proper, safe and expeditious manner. Time is of the essence and the time factor alone, not to mention the cost, which has to amount to many thousands of dollars of taxpayers money for meetings, hearings and further study is far beyond anyone's imagination.

To consider the time spent by myself and many other citizens of La Plata County with meetings and hearings both locally and with other government agencies, it appears as though this project is bogged down in the bureaucracy or it would be much closer for some positive decisions and noticeable action.

We believe that the standards could and should be modified and flexible enough so that they will not exceed the natural soil in that area before the tailings are placed there. We will look forward to an expeditious and favorable decision.

RTS:cdl
4-28-81

DEUEL and ASSOCIATES
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EPA TESTIMONY STANDARDS FOR UMTRAP
(Uranium Mill Tailings Remedial Action Project)
April 27, 1981
Durango, Colorado

I. Introduction

My name is Jamieson K. Deuel. I am the Principal of Deuel and Associates, an environmental consulting firm headquartered in Albuquerque, New Mexico. We have had a variety of experiences with uranium and nuclear power, including the following: 1) we were responsible for all of the environmental work and permitting on the world's only uranium mill tailings reclamation and recovery project in Naturita, CO, and 2) we worked on the unsuccessful attempt to duplicate that operation here in Durango. We, and I think Rahe Junge (Colorado Geologic Survey) gave us a testimonial earlier, have been working for over two years with Pioneer Uravan on the design, environmental work and the permitting of what several regulators have judged to be the nation's most environmentally advanced uranium mill project which is located in San Miguel County of Colorado. We are also working on a low level uranium ore heap leach operation in the Gas Hills

District of Wyoming. In addition, I am President of a Grand Junction firm called Environmental Reclamation Managers (ERM) which was formed solely to offer a service to the DOE in the disposing of virtually one-third of the entire volume of the UMTRAP project. I have also been, I guess one would say, the initiating catalyst in 1977 for the Uranium Epidemiology Study (UES), which I will speak about in more detail in a moment. I have spent a quarter century of my life in service to the federal government. I am a retired nuclear submariner with the rank of commander. I am here today to represent Ranchers Exploration and Development Corporation of Albuquerque, a former client of mine. I must confess that I feel less easy in this small group of experts than I did a few years ago when I was an international Olympic wrestling referee involved in a tournament in Ankara, Turkey, where there were 6,000 spectators all with cauliflower ears and you can rest assured that they were experts.

II. The Durango Story

Since we are in Durango, I would like to start my testimony with a little bit of history and talk about the "Durango Story" as we have sometimes described it in the past and how it may relate to the subject at hand. Ranchers, with our services, worked from 1976 to the very last day of 1978 to make this a going commercial operation. It was an attempt to duplicate the already, what we consider, successful and proven techniques and technologies in nearby Naturita.

Naturita was a project which involved about 600,000 tons of tailings where Durango would have been about 2½ times that size, about 1,500,000 tons. During the Durango project in over a year's time we looked at 18 different sites for geologic and environmental acceptability and chose the "best" one which we presented in our license submittal. It is somewhat ironic to me that a few years later we find another incentive to do this same work coming up with the same conclusion which was judged not totally acceptable in 1978.

I feel somewhat like the child in Aesop's fable of the emperor's new clothes. Although I do not have all of the technical background in some of the fields, I do feel that I have a reasonable engineering intelligence to ask questions. People tell me things and yet when I look at the reality of it I do not see it there. To me the reality was that here was a commercial operation that was going to take and move these tailings piles then——not being here testifying about how to do it today——and save the taxpayers, you and I, depending upon what estimate is used, a substantial sum. I notice that in the Federal Register you (EPA) estimate $11,000,000 per site. Ranchers, perhaps a little bit more experienced in this area, estimated over $20,000,000 potential savings to the taxpayer.

We posed at that time a type of environmental syllogysm that went something like this: If radon and the hazards are as bad as some people suggest they are, and if having a radon source near a large population is dangerous, isn't it sensible to move them as quickly as possible with, perhaps to use a number, 90% of the perfect solution then to leave them there and spend

years trying to get that refinement? On the other hand, we posed the alternate question that if it is not that serious, and we can afford to sit around and discuss this and appropriate monies for it, should not a company that is willing to do this now be allowed to do it? The permitting difficulty was, essentially, and there were some other points, the question of whether the company's committment to a 2-3 feet of compacted clay cover would be accepted versus the newly emerging standard of 3 meters and of course it was judged not to be acceptable.

III. The Time Element Question

I am confused as I listen to the testimony and read what is being proposed about the time element. The legislative intent, and I was one of several testifiers in 1978 before both US House and US Senate Subcommittees, as I read it, charged the EPA to develop standards within one year. And yet the EPA did not do this—so apparently legislative intent is not that much of a mandate or that serious. And yet now we are saying that there is a great urgency to go out and do things. I am confused. I am confused that we seem to be looking this year and, maybe, into 1982 for a permanent solution for a problem that will last 1,000 years at least without providing for less impacting, less environmental and economically impacting future solutions and without, at least, so far from what I can determine, an initial cost benefit analysis. I understand you gentlemen have now indicated that you will be required to do that. Thirdly, and

What was most confusing when we worked on the Durango project, was that no one out there could tell me what is the impact of finding this massive amount of soil cover? What will that impact be on the environment? For Durango we did somewhat of a "back of the envelope calculation". We concluded that, if we wished to minimize the environmental scar around this beautiful part of southwestern Colorado by excavating no deeper than two feet so that we didn't leave behind a big pit or quarry, that we would take about 400 acres out of circulation in this area. I can't imagine that going unnoticed in this part of the state. So I am wondering, are we rushing into some solutions that we think we are smart enough to design for permanently, or should we in fact have provision for emerging technologies, which I am aware are underway at the moment?

IV. What is the real danger?

Some of the testifiers have talked about the hazard and the danger. I question what is the real hazard and the real danger? I would like to quote from the January 9th Federal Register, p. 2556 where the EPA in its introduction, talking about this program, says,

> "Tailings are hazardous primarily because one, breathing radon and it's decay products exposes the lungs to alpha particles; two, the body may be exposed to gamma rays; three, radioactive materials and nonradioactive toxic elements from tailings may be swallowed from food and water" and then as sort of an amplifying note, indicates "The longevity of these hazards played a major role in determining the proposed standards".

And yet, on the next page the information takes as the basis for health effects the uranium miner as a reference point for assessing the relative hazard and it says,

> "This uncertainty (referring back to the data related to uranium miners) is increased when the data is used to estimate the risk to the general population".

Further on in this Federal Register, on page 2559, is this one sentence quote,

> "However there has been no opportunity to test these analyses against field scale full experience".

I would have to say that that is a categorically incorrect statement on two points. First of all, Naturita results are in fact a working field test. We did the post-operation monitoring for this project and found background readings around the reclaimed tailings of 2.45 pCi/m^2-sec. The readings on top of the reclaimed tailings, this 600,000 tons of tailings with approximately 2-3 feet of a very carefully compacted finely, engineered mancos shale cover, was 1.81 pCi/m^2-sec, which suggests to me that perhaps man was able to improve on the environment in this field situation. The second experience that I have and concern with the statement that there was no opportunity to test relates to a contact made to Ranchers through me by a researcher, Mr. David Dreeson at LASL (Los Alamos Scientific Laboratory) in early 1979. He suggested that before Ranchers recover the completed tailings material that a full scale field experiment could be conducted with federal support. The company was reluctant to delay their obligation and yet recognized that this could have a total benefit to the industry. They authorized me to proceed into technical negotiations with LASL. A proposal was prepared by LASL, it was submitted to the federal agencies, both the NRC, the DOE, and I believe the EPA. There was a certain time element because Ranchers, understandably, was not willing to sit around waiting and have their tailings exposed. Finally, the LASL people and myself were told that the federal government could not act quickly enough (3-4 months) to make this decision.

V. Uranium Epidemiology Study

I mentioned the Uranium Epidemiology Study. This is a multi-year (estimated 15-25 year) low level effects study being conducted by the University of New Mexico Cancer Research and Treatment Center. It started in 1977. It began with the review of 23,000 pre-employment physicals of uranium miners in the Grants-Ambrosia Lake District to see if a statistically significant sample population, qualifying under two counts could be developed. The two counts were (1) that the individual have actual underground working experience and (2) that that underground experience be a minimum of one year. A sample cohort of over 4,100 workers was identified and the study is proceeding to track these people, their health and those who have died. It is trying to learn about them as individuals and as data for this low level effects study. The principal investigator and I were talking just last week and he feels that right now this study has the world's most

extensive low level exposure records on file. They have discovered all sorts of old records that were in "dusty file cabinets." Today they are continuing to reduce the data.

There is an interesting early figure that I would like to share with you. In the post-1960 group there are about 2700 miners of the 4100 total. In the early search through mortality records, those death records within the local counties and within the state, there is not one single solitary recorded miner death of cancer. Now this is preliminary data because we still have to take and check through a lot of federal sources, such as social security to see if any miners may have moved away to other states and died there. Also many are not yet in the cancer latency period, but I think that it is a dramatic emerging statistic when one is trying to really find out what low level effects there may be. We do know about the highly publicized uranium cancer miner deaths in New Mexico, seven cases which have been put on television, and dramatized in print again and again. They were all pre-1960 miners, they all had over 200 working level months (WLM) exposure and all of them were known smokers.

The UES is reviewed by a prestigious Advisory Group that, in fact, has it's annual meeting at the end of this week. If anyone here were interested in attending that meeting, I feel that I could extend an invitation. Members of that Advisory Group include such eminent people as Dr. Vic Archer, Dr. Robley Evans, Dr. Clark Cooper, and so forth.

I would now like to show you a graph which was developed from the Uranium Epidemiology Study Research. The abscissa is time, the ordinate is working level months (WLM). At the beginning of the graph the industry standard exposure was twelve working level months per year. In 1969 the federal government established a new standard which was to be implemented by 1971. The twelve working level months had to drop to four working level months. If you look you can see that industry started implementing these standards immediately in 1969, although they didn't become mandated until 1971. In the post '71 period, the average exposure level is 1.30 WLM. This is important evidence of reducing the exposure levels and being able to control the low level exposures.

VI. Other evidence against the 2pCi/m^2-sec standard

I do not know what other uranium miner radon exposure experiences you may have been privy to but there is a recent paper that Dr. Bernard L. Cohen prepared, that is significant enough that I will take the chance of perhaps repeating it. Dr. Cohen's paper is titled "Radon Daughter Exposure to Uranium Miners" and was published just a few months ago. I don't remember whether it was published at the end of 1980 or the first part of 1981, but I can certainly make it available if anyone had an interest. In his study, and he worked with some of the data that the UES has developed, he investigates the uranium miner that you are using today as your reference point for health effects. That is why I am taking a moment on this

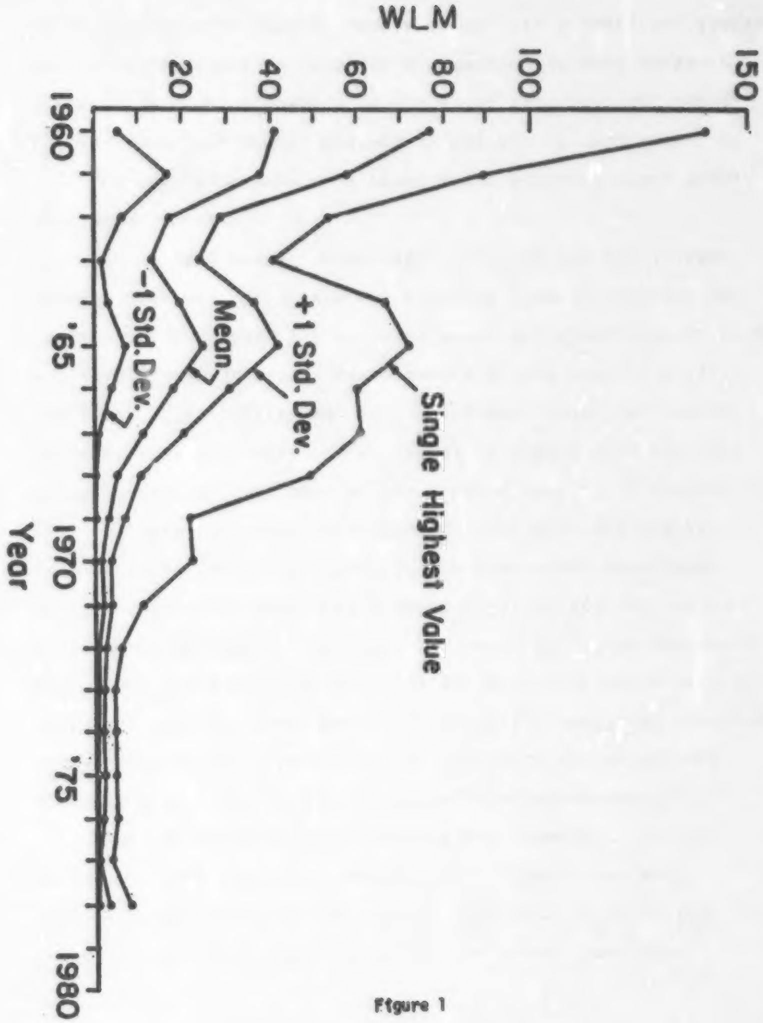

Figure 1

subject. He reports that uranium miner has a working average life time of 60 WLM. That is intermediate between the previous lowest levels of exposure for which lung cancers were identified (they were in the range of 120 to 240 WLM) and the average environmental exposures which are about 16 WLM. Dr. Cohen uses both the term loss of life expectancy (LLE) and the standardized mortality ratio (SMR) but we will concentrate on just LLE for simplicity.

Let's look at the two groups that he identified. Cohen called hypothetical Group A the range of 120-240 working level months, which was the lowest prior indication where excess cancers had occurred. And then the normally occurring environmental exposure he called Group B. The loss of life expectancy in Group A, worse than the reference point today, was 45 days out of someone's life and in Group B the environmental exposure loss of life expectancy was 10 days. Now how does that compare if someone is not used to working with LLE? If you remain unmarried throughout your life you lose 2200 days. This was sited once before at a presentation that I made and one of the quicker wits in the audience said, "Yeah, but it only seems like you live longer when you're married". Smoking cigarettes, a pack a day is also a 2200 LLE effect. Simply being poor and uneducated loses 800 days of one's life time. Being 10% overweight is 400, motor vehicle accidents alone are another 200 and yet we are worried about the population, which in the worst case, has a 45 day LLE.

One of the nation's most eminent health physicists is Dr. Keith Schiager and in October of 1979 he presented some testimony in Albuquerque before an NRC hearing and, again, I beg the panel's apologies if you are totally familiar with his work. He looked specifically at your 2pCi/m^2-sec flux value. First of all, he makes an argument that if there were no covering of any of these tailings in our country, over 1000 years there would be only ½ of a premature cancer death per year, or 250 over the total period. He states that even for the very unlikely worst case situation of a residence built directly on a reclaimed tailings pile with radon emission rate of at least 10 times larger than the proposed limit, which of course is our 2pCi/m^2-sec, the indoor exposure rate would still fall within the range of natural background.

The last citation that I would like to make today is to a work by Union Carbide PhD, Dr. Harry Rhodes. He has a very excellent paper on the cost-benefit analysis which I would again leave to your study if you have not seen it. But I would like to share with you this risk assessment chart that he developed. The abscissa is flux values in pCi/m^2-sec and really only pertains to the four curves. These highlighted notations are just a "for instance", and is where they fall on the ordinate which is risk for "health effects per million persons exposed per year". Note the flux limits 10, 20, 30, 40 and so forth. Here we have four curves and the GEIS which is the NRC prepared GEIS on Uranium Mining and Milling. Notice that all four of these curves,

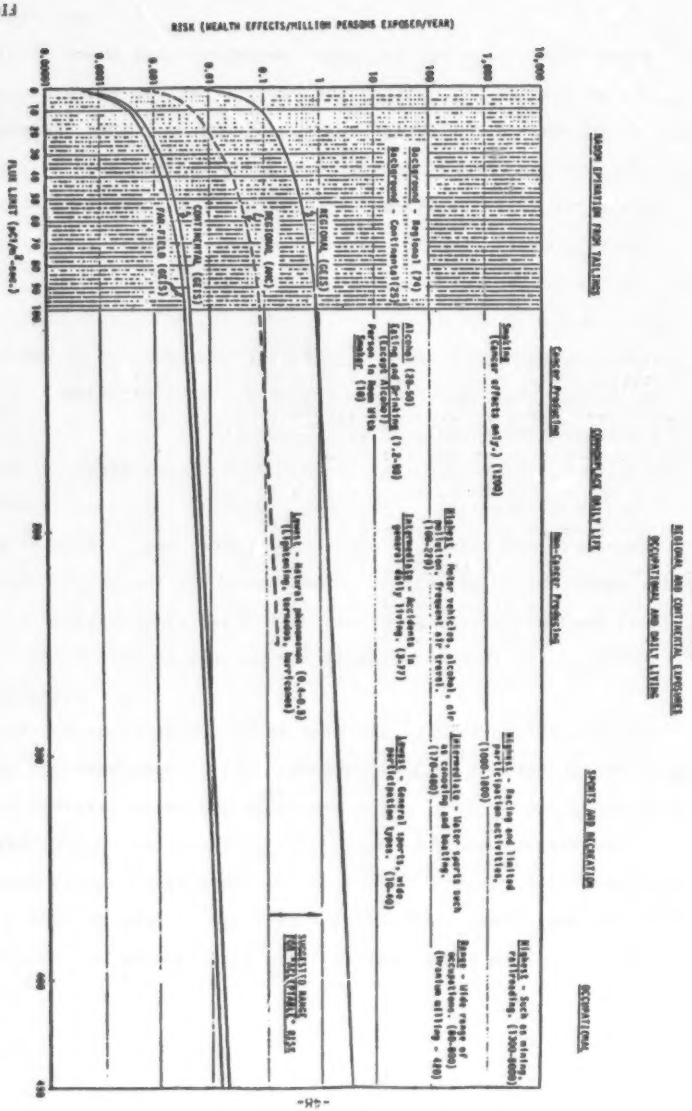

FIGURE 1

the curve for regional GEIS, continental GEIS, the far field GEIS, plus the American Mining Congress' own interpretation of the data—the value that you're talking about ($2pCi/m^2$-sec) is almost down here at this edge near zero risk. And if we accept what I understand are the normally accepted risks to the general population, and any health physicist can correct me, they should be between 0.1 and 1 health effects. Any one of these curves at 2 is well below the 0.1 to 1 health effects range. We could even go up to 10 pCi/m^2-sec on the most conservative one before reaching 0.1 health effects.

VII. Conclusion

In conclusion, I have lived most of my adult life with radiation and radiologic effects and believe that the proposed standards are too inflexible. I feel that they are too demanding and that some of the questions that came out in the testimony before mine are on the right track. We must look at cost-benefit analyses and there is numerous data that I have that perhaps you also have. I see no provision for emerging and/or developing technologies, although I am sure that you are all aware of the research and work going on at Battelle Pacific Northwest and other places and some of the experimental work that is already being done. I would expect to see breakthroughs within our life times that could significantly reduce the environmental impact of obtaining the huge three meters of soil cover. I think that the impact of that amount of soil cover has to be assessed some place and if it already is perhaps someone would

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share it with me. I have looked around and have not found such an assessment. And I pose a question that I think is an interesting one. Ranchers Exploration and Development Corp. came to what was one of the country's waste heaps and reclaimed for the nation valuable assets of vanadium and uranium. What do we know about the future generations and their need for resources and the new recovery technologies that may be available to them that allows us to bury today's waste heaps under three meters or more of soil cover? Are we denying them resources that may be important to them? Finally, I must disagree with my friend Rahe Junge emphatically on the practability of evaluating inactive sites and active sites with the same standard. Our firm has worked with both and there is clearly a distinction to be made when you start with a new mill that is not yet in existence. You have a lot more options in siting than you do when you come into an existing inactive site that is a residual from the WW II national crisis days. There is a dramatic difference in those two conditions.

Thank you. I will try to answer any questions you may have for me.

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Union Carbide Corporation

On Behalf of the American Mining Congress
On the Environmental Protection Agency's
Proposed Disposal and Clean-up Standards for
Inactive Uranium Processing Sites
(46 Fed.Reg. 2556, January 9, 1981)

May 14, 1981

The American Mining Congress is an association of companies engaged in every aspect of the mining and minerals processing industry. As such, the AMC represents the principal domestic producers of uranium. Because of the potential connection between the proposed standards for inactive uranium processing sites and future standards for active sites, the AMC, as a representative of its members, is an "interested person" entitled to comment on the proposed standards. For this reason, we express our appreciation for this opportunity to testify.

As a preliminary matter, we call the attention of the Agency to Executive Order 12291 (46 Fed.Reg. 13193, Feb. 19, 1981). This order, which was effective upon its issuance, requires in specific terms EPA to engage in cost/benefit analysis before promulgating any regulation. When proposing a major rule, the Executive Order requires the Agency to prepare a draft, and later a final, regulatory impact analysis to accompany the proposal through the regulatory process. We believe, for reasons hereafter stated, that the proposed inactive site standards constitute a major rule requiring a regulatory impact analysis. We, therefore, request that the comment period not be closed until the regulatory impact analysis is issued and until sufficient time is allowed for public comment upon it.

I. The Proposed Standards Fail to Conform to the Requirements of the Uranium Mill Tailings Radiation Control Act.

A. The Purpose of the Uranium Mill Tailings Radiation Control Act.

The Uranium Mill Tailings Radiation Control Act states that "uranium mill tailings...may pose a potential and significant radiation health hazard to the public" (emphasis added). From this statement, two points must be made. First, Congress did not find that uranium mill tailings present a significant hazard. Secondly, Congress indicates that it is significant health hazards that are of concern. Thus, the level of public protection contemplated by Congress is to be that which is necessary to minimize significant health hazards.

This intention is confirmed by the direction to develop a program "to stabilize and control...tailings in a safe and environmentally sound manner and to minimize or eliminate radiation health hazards to the public" (emphasis added).

B. EPA Has Failed to Establish a Need for the Proposed Standards

The Act requires the development of a program to control tailings in a safe manner. A safe manner is not tantamount to a risk-free manner. The Act, as reasonably construed, requires only the minimization of significant risks of material harm.

EPA has not provided an adequate assessment of the nature and extent of the hazard, if any, posed by residual radioactive materials. EPA's analysis is based on a series of assumptions which conclude that some health effects may occur.

EPA acts on the assumption that any risk is unacceptable. However, as indicated by the decision in the Benzene case, Congress could not have reasonably intended EPA to have such authority. Before EPA can impose specific standards, it must be established that a significant risk of health hazard exists. This the Agency has failed to do.

No comparison with other publically accepted risks is made. It is even admitted that at the low radiation levels involved, the effects may not be detectable (DEIS page 4-1). No clinical evidence of medically significant effects is presented. No attempt to realistically assess the harms and risks is made. Only a brief, pseudo-theoretical assessment of the health risks posed by the tailings piles is discussed. Further, this assessment makes no attempt to scientifically distinguish the various theoretical risk estimate techniques. The estimates are based on unpublished scientific documents which have not been subjected to peer review. For example, the health effects discussion in the Draft Environmental Impact Statement (DEIS) relies heavily upon a Florida phosphate study which relies on an unpublished report entitled "Facts in Exposure Response Relationships of Radon Daughter Injury" by V. E. Archer. This unpublished highly questionable report also is relied upon directly in the DEIS. Such use of unpublished information is inappropriate, especially when published, peer-reviewed information of high scientific credibility is available e.g. BEIR III, and "Estimate of Risk From Environmental Exposure to Radon-222 and Its Decay Products," R. D. Evans, et al., Nature, 290, March 1981.

To put the EPA estimate in perspective, the AMC offers the following information. The EPA assumed estimate is about 2 premature deaths per year. Setting aside the problem that such

a low rate would not be detectable in the population, this assumed rate should be compared to other risks of fatalities. Other risks of fatalities per year, based on clinical evidence are: all accidents - 100,000; automobile accidents - 50,000; alcohol - 56,000; drowning - 8,000; poisons - 4,000; choking on food - 3,000; and firearms - 2,500. Thus, the 2 assumed fatalities per year from the inactive tailings sites represent several orders of magnitude less of a danger than many other actual risks commonly accepted by the public. NRC's Generic Environmental Impact Statement (NUREG-0706) estimates the maximum number of premature deaths in the U.S. from background radiation is 8,060 per year, this, compared to 2 premature deaths from uncovered tailings.

Thus, the entire costly remedial action standards are based not on substantive evidence of significant risk of material harm to be controlled, but on a series of assumptions and policy considerations designed to justify elimination of all possible theoretical risks which might be posed by tailings. Such standards are contrary to the Uranium Mill Tailings Radiation Control Act and are unreasonable and arbitrary.

II. DEIS Does Not Comply With the National Environmental Policy Act

The Uranium Mill Tailings Radiation Control Act requires that the program for control of tailings be conducted in an environmentally sound manner. The National Environmental Policy Act requires the consideration of the environmental impacts of the regulations. These two acts require that an assessment of the environmental impacts of the standards be conducted to assure that the least environmentally disruptive alternative is selected and that environmental mitigation measures are inlcuded where practicable.

The environmental impact assessment provided by EPA in the DEIS is inadequate. Only the hypothetical impacts of the tailings are considered in any depth. No evaluation of the detrimental environmental impacts of implementation of the proposed standards is made.

In the arid West, where many of the sites are located, stripping of land has very important reclamation considerations. Delicate vegetation is destroyed by both the actual earthwork itself and the movement of heavy equipment in the peripheral areas. Such vegetation must be replaced. The environmental and health effects of such actions have not been evaluated.

Earthwork and trucking activities involve substantial risks. For example, it has been estimated that a seven-year remedial action program to remove tailings from Salt Lake City will incur 5 fatalities and 62 injuries among the clean-up workers (Memorandum for the Record dated March 12, 1981, U.S. House Committee on Armed Services). Yet, EPA makes no attempt to evaluate these actual risks to remedial action workers against the hypothetical risks to the public from the tailings piles. EPA dismisses these known risks from occupational hazards as temporary and negligible (DEIS page 6-10). For the workers killed or injured, these hazards are not temporary or negligible.

Other risks associated with remedial action work to the levels in the proposed standards have not been given adequate evaluation. No evaluation of the potential public exposure as related to the exposure from other alternative standards has been made.

Moreover, the socioeconomic impacts of the standards have not been given adequate consideration. The simplistic assessment in the DEIS of temporary benefits does not justify the avoidance of consideration of impacts to the local human community. Consideration of potential impacts to the cultural/archaeological resources of the area were also ignored, contrary to the requirements of the National Historic Preservation Act.

III. The Proposed Standards are Unreasonable

A. Natural Background Assumptions are Erroneous

The proposed standards are based on the erroneous assumption that there is an "average" or "normal" background radiation level. Due to the extremely wide range of environmental conditions which exist in nature, the use of a computed average as the basis for the standards is unduly restrictive. The standards should either be on a site-specific basis or, if general standards are to be applied, they should be within the range of natural background. This would assure that present and future generations would not be subjected to risks that are different in kind or magnitude from those imposed by nature.

B. One Thousand Year Effectiveness

The selection of a 1000-year period is unreasonable. The state-of-the-art cannot be guaranteed to be effective for at least 1000 years. A time period of 100 years, during which there would be a reasonable expectation that the standards will be satisfied, would be realistic and reasonable. The time period selected should be based on what can reasonably be projected to provide control. On this basis, a target period of 100 years is reasonable.

C. Radium in Soils

The proposed clean-up standard for radium-226 in soils provides for reasonable assurance that in any 15 cm thickness below 1 foot, the Ra-226 concentration shall not exceed 5 pCi/gm.

This standard is based upon a consideration of the radium-radon exposure pathway. In its discussion, EPA relies upon two basic assumptions. These are that (1) indoor radon decay products in excess of 0.01 WL pose an unacceptable health hazard, and (2) radium-226 soil concentrations of 5 pCi/gm or greater will result in radon decay product levels in structures in excess of 0.01 WL.

The conclusion that indoor radon decay products in excess of 0.01 WL pose an unacceptable health hazard is highly questionable. A significant portion of structures in the U.S. exceed the proposed limit of 0.015 WL even though they are not associated with tailings.

Radon flux rates for a given Ra-226 soil concentration are very sensitive to a variety of conditions including, for example, grain size distribution, moisture content, compaction, and barometric pressure. The indoor radon decay product levels are also dependent on the type of building materials and configurations.

Thus, establishment of a correlation between radium-226 in soils and indoor radon levels is precarious at best. If the radium-226 standard is founded on indoor radon decay product concentrations, some assessment of the depth/exhalation phenomenon is needed.

EPA relies on two publications for its conclusion that a 5 pCi/gm radium level correlates with a 0.01 WL. One is the Healy and Rogers report which makes a *preliminary* study of radium-contaminated soils. The report argues, it does not conclude, that indoor radon decay product concentrations of 0.01 WL *might be expected* for soils with radium concentrations of 1 to 3 pCi/gm. This is not a reasonably scientific foundation for standard setting.

EPA also relies on the NRC Staff Technical Position on Interim Land Clean-up Criteria for Decommissioning Uranium Mill Sites in the NRC Draft GEIS. EPA uses this document to conclude that 3 to 5 pCi/gm of radium can cause indoor concentrations of 0.01 WL. However, the table indicated radon levels inside structures on land averaging 5.0 pCi/gm Ra-226 would range anywhere from 0.0024 to 0.04 WL units. This wide range of radium values points out the questionable validity of the use of a radium-226 standard for remedial action.

A comprehensive analytical study of radon flux rates that can be anticipated under conditions typical of uranium mining conditions in the western United States has recently been completed by industry. This was provided to EPA as part of AMC testimony on EPA Resource Conservation and Recovery Act Regulations (Statement of S. Baker on March 9, 1979). The study shows that structures with average ventilation which are situated on reclaimed waste rock deposits having Ra-226 concentrations averaging 20 pCi/gm to infinite depth will normally exhibit radon decay product concentrations on the order of 0.01 WL. Similar structures situated on deposits having Ra-226 concentrations averaging 20 pCi/gm near the surface and up to 70 pCi/gm below to infinite depth are shown to exhibit decay product concentrations no greater than 0.02 WL. From this study, it can be seen that a 5 pCi/gm cut off used to control indoor radon decay product concentrations tc 0.01 WL is unreasonable.

The health risk posed by tailings material on open land has not been assessed. The highly tenuous correlation of radium-226 in soils with indoor radon decay product concentrations makes the use of such correlation unreasonable. No discussion of alternate indoor radon controls has been made. No need for the 5 pCi/gm radium-226 standard has been shown.

Nature exhibits an extremely wide range of environmental conditions. Inadequate consideration has been given to the practical problems associated with the implementation of the proposed standard. Current field instrumentation cannot detect radium-226 concentrations in the specified layers. There would be no assurance that all areas contaminated by tailings in excess of 5 pCi/gm would be identified. Another problem is how to attribute various radium-226 levels to tailings contamination. Considering the wide range of radium background concentrations in the western states and that there has been no background survey, it will be difficult to determine whether some areas exhibit radium-226 levels in excess of 5 pCi/gm due to tailings contamination or because of the presence of natural

pockets of high background levels. Verification that every area of greater than 5 pCi/gm radium-226 levels attributable to tailings has been detected and cleaned-up to standards will be impossible to achieve.

Not only are the practical limitations of the field instrumentation and verification process not considered, the problems inherent in existing analysis techniques for radium-226 are ignored. Present techniques are slow and time-consuming and lack the precision necessary to measure low concentrations accurately.

Since the radium standard is not directly related to health effects, an assessment of alternative bases for standards should be considered, for example gamma flux. A flexible standard based in part on local background concentrations may be another potential alternative. Under the proposal, dirt removal will be required to comply with the standards. Reclamation standards should be considered. Such alternatives could provide the degree of health protection desired for the public at a much reduced cost.

D. Radon Emanation Rate

EPA has proposed that radon emanation from inactive tailings piles not exceed an average annual rate of 2 pCi/m^2 x sec. EPA's justifications for such a standard are that it will return radon flux to levels near background; that the cost of meeting the 2 pCi limit will be only 10% more than meeting some less stringent level of control; and that it will avert 200 lung cancer deaths per century.

To begin, the assertion that 200 lung cancer deaths will result if no remedial action is undertaken is erroneous. Better data (Evans, et al.) indicate that no more than 30 per century will occur.

EPA's stated objective of returning radon flux to levels in the range of natural background is not related to health risk and therefore is not an appropriate basis for a health standard like the proposed inactive site standards. As stated above, EPA's authority under the Uranium Mill Tailings Radiation Control Act is limited to proposing standards that are health based. The same holds true for the statement that the 2 pCi standard is reasonable, because it will only cost 10% more than a standard of 10-40 pCi. Ten percent of several hundred million dollars is an absurd amount to spend if it results in very little benefit. Requiring such an unnecessary expenditure violates Executive Order 12291.

The inactive site standards must be based on a reasoned evaluation of health risk. They must also be cost-effective. Even if EPA's estimate of health effects was accurate, it is unreasonable to spend hundreds of millions of dollars to prevent the equivalent of 2 estimated deaths per year from lung cancer -- a number that is totally indistinguishable from the thousands of deaths attributed to lung cancer every year in the United States. The EIS estimates that a radon exhalation limit of 2 pCi will prevent 99.6% of the 200 health effects that would occur each century if the piles were left uncovered (EIS, p. 6-7). The 1978 Uranium Mill Tailings Radiation Control Act does not mandate total elimination of risks.

As indicated by Evans, et al., the risks associated with radon emissions from tailings are insignificant. On this basis, AMC proposes that no radon flux standard should be included in the inactive site standards. This is consistent with the Uranium Mill Tailings Radiation Control Act which requires a showing of significant risk by EPA before it issues regulations.

E. Indoor Radon Daughter Concentrations

The 0.015 WL remedial action level for habitable buildings was promulgated without public comment by EPA as an interim cleanup standard. This interim standard is at distinct variance from the remedial action level set for persons residing on Florida phosphate lands, namely 0.02 WL, including background. The citation for the source document recommending 0.015 WL in the Draft EIS is AR 79, p 4-40. The reference citation was not accepted by peer review for publication.

The EPA is using a risk factor estimate of 10^{-3} per WLM for radon exposure related health events which is not generally accepted. The most scientifically based risk assessment factor is 10^{-4} per WLM as an upper bound of the risk (Evans, et. al.). This upper bound value is based on meticulous review of all USA and Czeckoslovakian uranium mining epidemiologic data. Based on these data, there is no proper scientific basis for selecting the unnecessarily restrictive value of 0.015 WL for the indoor radon exposure limit, including background values. In the draft EIS, the large uncertainty surrounding the risk estimate for radon related health effects is freely admitted and casts doubt upon the probity of extending the results to the general public.

NRC's 10 CFR 20 recommends limits for nonoccupational radiation exposure a level of one-tenth the occupational exposure limit, or 0.03 WL. This is a more rational level and has wide acceptance in the scientific community. The Surgeon General recommended 0.05 WL as an upper limit for cleanup in Grand Junction buildings contaminated with uranium mill tailings.

U.S. Radiation Policy Council advises that a generic study of the frequency distribution of radon exposure in structures should be made a necessary first step before Federal control actions on more than a local, problem oriented level are contemplated. We believe EPA should delay setting such a standard and rely on the Surgeon General's guidelines of 0.05 WL upper limit for cleanup of potentially contaminated habitable structures near inactive tailings areas.

F. Groundwater Contamination

AMC has a number of specific concerns with respect to the ground and surface water standards. EPA has not given any consideration to the existing or anticipated uses of the surface and groundwater it is proposing to regulate. Because of the shallow depths of many uranium ore deposits, it is not uncommon for the original quality of water where a tailings disposal site is located to not be suitable for drinking water. Rather than acknowledging this, the proposed regulations set out to treat virtually every water bearing formation or water body as if it were a drinking water source.

The proposed regulations require that seepage not cause concentrations of selected elements in groundwater to exceed the maximum contaminant levels for particular substances under the National Interim Primary Drinking Water Standards. This prescription would in many cases make little sense. For example, if the initial water quality of an aquifer underlying a uranium mill tailings pond renders it suitable only for industrial use, what purpose would be served in prohibiting a slight increase, or indeed a large increase, in the concentration of one of the listed substances?

It appears arbitrary to lift a set of standards from one statute applicable to drinking water supply and apply it to another statute intended to govern groundwater absent to compelling rationale. Such a rationale is, however, lacking anywhere in the DEIS.

Certain criteria listed in Table A appear to be unduly restrictive. These criteria will commonly be exceeded by normal background conditions.

The suggested limit of 10 pCi/liter for uranium does not appear to have any sound scientific basis. Guidelines for uranium in water have been promulgated by federal, state, and international agencies. NRC, based on chemical toxicity, proposed 30,000 pCi/l for workers which calculates to 3000 pCi/l after dilution. The Wyoming Department of Environmental Quality has adopted 5 mg/l or 3400 pCi/l. Colorado Department of Health suggests 10 pCi/l is too restrictive. The ICRP (Publication 30-1979) established an annual intake for workers based on radiological effects equivalent to 14,800 pCi/l for the public. This may be conservatively low because the ICRP model may overestimate the radiological bone cancer risk factor. Again, these standards must be health based under the Uranium Mill Tailings Radiation Control Act. EPA has not established the health need for these groundwater standards.

IV. The Cost of the Proposed Standards are Underestimated

A. Costs are Ignored

In Chapter 6 and the cost estimates in Appendix B of the DEIS, AMC notes numerous omissions and inadequacies. Costs for engineering, field supervision, or contingencies are not considered. Provisions for reclaiming the land from which topsoil, cover, or riprap is obtained are not considered. To purchase topsoil may be impossible, as most states require saving topsoil for reclaiming the land from which other cover material is borrowed. If the tailings are moved to a new location, the topsoil at the new location will have to be excavated and vegetation established to prevent erosion during the storage period until the tailings are moved. Riprap is not a readily available material, nor is it free. It will probably have to be quarried, and we see no costs to cover this. In some locations, a suitable clay at a nearby location is nonexistant or is very scarce; or if available, only at a considerable distance. These costs are not considered.

The unit costs in the DEIS were compared with costs being experienced in actual tailings dam reclamation work. The industry experience in some instances compares favorably with the costs in the DEIS; however, for below-grade excavation, transportation, synthetic liners, and soil and vegetation cover, the industry figures are 2.5 to 3 times higher.

Te evaluate the effect of the estimating methods as well as the unit costs, estimates for two cases comparing EPA and industry figures were made. For Option 2, reclamation in place, industry costs were from 1.8 to 2.7 times higher than EPA's.

By similar comparisons for moving the tailings to a new disposal area (option 3 in the DEIS), the industry figures were from 2.7 to 2.9 higher than the EPA estimates.

The EPA estimates do not include the costs for reclamation of the borrow sites and makes no provision for costs of cleanup around the mill sites, remedial action at offsite locations where tailings may have been used for fill material, survey and decontamination of used equipment, burial of contaminated equipment, demolition and disposal of buildings or reclamation of the mill site.

B. Total Cost of Project

AMC believes the total remedial costs for the 24 inactive mill sites which EPA estimates at $200-300 million (page 5-3 and 9-8 in the DEIS) will more likely approach $1 billion if the proposed EPA standards are adopted.

We have estimated the total cost of the 24 inactive mill sites assuming 17 are reclaimed in place and 7 are moved to new below-grade disposal sites (Table 2-4, pages 2-16 and 2-17 in DEIS). Based on EPA estimates, the total costs will vary from $50 to $200 million. This is the cost for tailings reclamation only and does not include many other remedial actions required as mentioned earlier. Industry estimates that the total tailings reclamation cost could range from $140 to $450 million.

C. Cost-Benefit Considerations

The thicker the cover, the higher the cost, and the less radon release from the covered tailings. The DEIS states that "...reducing an uncontrolled radon release rate of 450 pCi/m^2 --

sec to $10 pCi/m^2$ -- sec would avert 98% of the potential effects of radon emitted from the uncontrolled pile." Taking into consideration all the inactive piles, this would theoretically reduce the 2 premature deaths per year to 0.04 per year.

Using a more recent estimate of risk from exposure to radon-222 as proposed by Evans et. al., the 90% reduction of radon would reduce the premature deaths from 0.3 per year from the uncovered piles to 0.006 per year. This would be equivalent to a cost of $2.3 million (EPA) to $17 million (industry) per premature death averted per century. This value is, of course, absurd.

Reducing the radon by approximately 80%, or to an emanation rate of $100 pCi/m^2 \times sec$, would reduce premature deaths from 0.3 to 0.06 per year at a total cost of $50 to $360 million. Even this calculates to be $2 million (EPA) to $15 million (industry) per premature death averted per century, still an unreasonable figure. The inclusion of a radon emanation limit in the proposed standards cannot be justified on health effects.

In summary, we believe the total cost for the entire remedial action project designed to meet the proposed EPA standards will likely approach a billion dollars. This will result in a cost-benefit ratio which, using even the lowest figures, is greatly out of reason. Less restrictive standards will greatly reduce costs and still insure long-term stabilization along with reducing health risks which, even without controls, are not now at unacceptable levels. In fact, for health effects

alone, the expenditure of $300 million to $1 billion, whatever estimate one uses, would be far better spent on many more critical risk avoidance measures.

Because Congress and state legislatures must approve the appropriations for all remedial action, it appears prudent in these times of budget constraints to develop standards which are reasonable and which may be accomplished at the lowest possible cost. The magnitude of costs required to meet EPA's unnecessarily strict standards may jeopardize the entire program.

Testimony for Water Quality Standards
Washington, D. C.
May 14, 1981

James C. Gilliland

My name is James C. Gilliland, Director of Environmental Control for the Molybdenum Division of AMAX Inc. AMAX's activities and interests cover a broad range. Metal and mineral interests include molybdenum, tungsten, nickel, cobalt, aluminum, copper, lead, zinc, cadmium, iron ore, metal powders, precious metals, coal, agricultural chemicals, oil and natural gas. As the world's leading producer of molybdenum, we are naturally concerned about any proposal that could, either by inference or actuality, impose a new constraint on the production and use of this important mineral. Almost half of all molybdenum produced is used in alloy steels. Moly chemicals are important as catalysts, paint pigments, corrosion inhibitors, smoke and flame retardants, lubricants and in agriculture.

I should explain that AMAX at this time has neither any inactive uranium processing sites nor active uranium processing sites. Our interest in this proposed regulation, therefore, is the precedential aspect regarding the question of a molybdenum water standard which could impact directly via future regulations or permitting pathways on any activity wherein molybdenum is produced or used.

We have submitted our complete testimony in written form, including both the legal and scientific arguments. This oral presentation will highlight only some of the scientific toxicity questions raised by the proposal, except for, at this time, brief mention that our legal position is that EPA has no authority to promulgate the standard under the Uranium Mill Tailing Radiation Control Act. However, assuming that EPA had the legal authority to do so, and acknowledging that EPA has the legal authority under other Federal legislation to do so, it is our scientific position that the status of available knowledge concerning the toxicity level of molybdenum in water denies that a standard is justifiable at this time.

We have been advised by Dr. Stanley Lichtman of EPA that the document relied upon as the basis for the proposed molybdenum standard is a report entitled "Human Health Effects of Molybdenum in Drinking Water". This document was prepared for the EPA Health Effects Research Laboratory under a grant provided to the Environmental Trace Substances Research Program at the University of Colorado, Boulder, Colorado. The principal investigator for this study document is Dr. Willard Chappell and I will use his name when referring to this document. In that document, you will find that Chappell states that "It is not likely that a drinking water standard for molybdenum is required. But, we believe that 50 micrograms molybdenum per liter represents a prudent guideline." Chappell's justification for this 50 micrograms molybdenum per liter guideline is stated as "Since no biochemical changes were found in subjects consuming water up to 50 micrograms molybdenum per liter, it can be assumed such a level does not cause any adverse biochemical or health effects." We view this assumption as hardly a scientific determination of the level of toxicity to be used for the setting of a standard by EPA.

The proposed molybdenum standard subject to this hearing today was selected by EPA "on the basis of avoiding toxic effects in humans". The Chappell study found no biochemical changes in humans at that level. Other levels could have been as easily decided upon as no biochemical changes were experienced at drinking water levels below 100 micrograms per liter and a majority of subjects showed no biochemical changes at much higher levels. In fact, as distinguished from biochemical changes, there were no human health effects found at any level of consumption of molybdenum of less than 1.5 mg/day. Insofar as human water consumption is concerned, this equates to a concentration of molybdenum in water of somewhat greater than 600 micrograms per liter to reach this daily intake of 1.5 mg/day. At a level of 50 micrograms per liter of molybdenum in water, however, all we know from the study is that there is an absence of any biochemical changes. Most certainly this does not define a level in excess of which might represent a threshold of hazard to human health.

Dr. Walter Mertz, Agricultural Research Service Nutrition Institute, U. S. Department of Agriculture, also addressed this subject of dietary intake of molybdenum in a 1975 paper entitled "Defining Trace Element Deficiencies in Toxicities in Man". His interpretation of the same studies reviewed by Chappell reached the same conclusion that molybdenum intakes of 1.5 mg/day do not appear to have any noticeable human health effects. Dr. Mertz states a tentative conclusion that "a molybdenum concentration of 150 to 1000 micrograms in the diet is probably safe and sufficient".

Further, Mertz addressed the question of dietary deficiency of molybdenum as well as its excess in the following manner. "It is important to know that it is not only the excess of the trace element which is unsafe, but equally important, the deficiency. Although man's activities are better known for their introduction of excessive levels into the environment, they can also result in deficiencies."

In the light of some recent studies from China that have shown a very high incidence of human esophageal cancer in areas where there is a molybdenum deficiency in the agricultural soils, this question of molybdenum deficiency is receiving increasing attention.

As to chronic toxicity, there is some information suggesting that a daily intake of up to 10 to 15 mg of molybdenum may present a problem in this regard. Assuming a normal intake of molybdenum via food, this would take concentrations of molybdenum in water of up to somewhat more than 7000 micrograms per liter to reach this level of chronic concern.

It should also be pointed out that the Chappell study relates this guideline level of 50 micrograms per liter to drinking water and not to groundwater quality as would be the case in this EPA proposal. Even then, as the Chappell results relate only to a guideline, it seems clear that the establishment of an appropriate molybdenum standard for either ground or drinking water represents little more than a guess. This guesswork is clearly distinguishable from the detailed procedures and methodologies employed by EPA in the establishment of water quality criteria for the 65 toxic pollutants, among which molybdenum is not included.

Even under EPA's more expansive interpretation of its legal authority under this Act, with which we disagree, EPA has authority to promulgate standards for the protection of public health and safety from hazards. All we have here, the whole basis of information around which the standard has been proposed, is a recommendation of 50 micrograms per liter as a guideline and not as a standard. And, at this guideline level, there is a showing of an absence of any biochemical changes or health effects. This guideline level, therefore, does not define nor was it intended to define a level in excess of which might represent a hazard to human health. It should be noted that molybdenum is not listed as a hazardous or toxic substance under the Resource Conservation and

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Recovery Act or under the Clean Water Act. Neither is it included in any of the water quality criteria documents of recent issuance by the EPA, nor in the National Interim Primary Drinking Water regulations.

In addition to consideration of the potential health effects of molybdenum in drinking water, the proposed standard for molybdenum is presumably based on a consideration of its potential mobility through groundwater. However, the supporting draft environmental impact statement document indicates that the determination of mobility for molybdenum ions is based on, admittedly, "extremely limited data" and it is not listed in the draft environmental impact statement as having a high probability of being mobile. EPA states, moreover, that prevention or reduction of seepage of known high mobility substances such as selenium and zinc should control those other substances for which no confirming data are available, such as for molybdenum. Therefore, at least in this particular circumstance, it would seem that EPA need not concern itself with a standard for control of molybdenum which is a less mobile substance than selenium or zinc even if the toxicity levels were such as to warrant the establishment of a standard.

In summary, therefore, notwithstanding the legalities of whether the Uranium Mill Tailing Radiation Control Act provides EPA the authority to promulgate a groundwater standard for molybdenum, it is our opinion and our position that such a standard under this Act is inappropriate and unnecessary and should be deleted from the final regulation. If it appears necessary for molybdenum in water to be regulated, EPA has ample authority under other legislation to do so, wherein procedures are carefully designed to ensure that such a standard setting process is not an arbitrary and capricious action unsupported by substantial evidence.

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CLIMAX MOLYBDENUM COMPANY
AMAX MOLYBDENUM DIVISION
AMAX INC

EXTERNAL AFFAIRS

May 7, 1981

Dr. Stanley Lichtman
Director, Criteria & Standards Division (ANR-460)
Office of Radiation Programs
U. S. Environmental Protection agency
Washington, D. C. 20460

Re: Proposed Standards for Inactive Uranium
Processing Sites

Dear Dr. Lichtman:

As stated in my letter to you dated May 5, 1981, enclosed are written comments prepared on behalf of Climax Molybdenum Company with regard to subject proposed standards.

Very truly yours,

James C. Gilliland
Director of Environmental Control

JCG:hmn

Enclosure

cc: D. Delcour
J. Raisch

Rec'd ORP
5/11/81

13949 West Colfax Avenue, Bldg. No. 1 • Golden, Colorado 80401 • 303/234-9020 • TWX: 910-937-0746

Comments on EPA's Proposed Disposal Standards for Inactive Uranium Processing Sites

AMAX Inc.
May 11, 1981

SUMMARY

The Environmental Protection Agency does not have authority under the Uranium Mill Tailings Radiation Control Act (UMTRCA) to promulgate a groundwater quality standard for molybdenum. The promulgation of a molybdenum standard is not consistent with the standards established under the Solid Waste Disposal Act (SWDA/RCRA) and, therefore, is not in accordance with UMTRCA. The toxicity level and the level of hazard to the public health from molybdenum is not quantifiable at the present time. The sources cited for the proposed standard are in conflict internally and with other reputable sources, and do not establish a concentration level which represents the threshold of avoiding human health hazards. The decision as to the proposed molybdenum standard is not supported by scientific evidence and is clearly arbitrary.

ANALYSIS

I. Legal Authority to Promulgate Molybdenum Standard

A. Uranium Mill Tailings Radiation Control Act of 1978, P.L. 95-604

1. The Uranium Mill Tailings Radiation Control Act (UMTRCA) does not authorize EPA to promulgate standards for nonradioactive substances such as molybdenum. EPA's authority under UMTRCA is limited to radioactive materials. The UMTRCA provided in Title II, Sec. 206, amending Sec. 275 of the Atomic Energy Act of 1954, 42 U.S.C., Sec. 2022, that EPA:

> shall, by rule, promulgate standards of general application...for the protection of the public health, safety, and the environment from radiological and nonradiological hazards associated with residual radioactive materials...located in inactive uranium mill tailings sites...

EPA has interpreted the above language to mean that EPA may control nonradiological materials (such as molybdenum) that are incidentally found associated with residual radioactive materials. We believe this interpretation to be in error and that the proper interpretation is that EPA may control nonradiological hazards (such as toxicity levels of uranium) directly associated with residual radioactive materials. The term "residual radioactive materials" is defined in the Act and in legislative history as only the radioactive components of tailings and other wastes. In summary, we believe that EPA's authority is limited to control of residual radioactive materials and that such authority can be applied to either radiological or nonradiological hazards of such radioactive materials.

The remedial action to be taken by the Secretary of Energy is to "assure the safe and environmentally sound stabilization of residual radioactive materials..." UMTRCA, Sec. 108, 42 U.S.C. 7918(a)(2). Although the House Committee on Interior and Insular Affairs may have suggested that the UMTRCA authorizes EPA to promulgate standards to control nonradioactive substances, it is apparent that the Committee on Interstate and Foreign Commerce reporting to the entire House of Representatives did not intend to give EPA authority to control nonradioactive substances such as molybdenum.

2. Even if EPA's interpretation of the scope of Section 206 is correct, the standards to be promulgated by the Administrator under UMTRCA are "to the maximum extent practicable to be consistent with the requirements of the Solid Waste Disposal Act, as amended..." 42 U.S.C. 2022a.

The legislative history of UMTRCA shows that the House intended that these "standards must be consistent with the Solid Waste Disposal Act" (emphasis added). House Report 95-1480 - Part 2, on H.R. 13650, p. 46; U.S. Code Cong. and Admin. News, 95th Congress, 2nd Session, Vol. 6, p. 7473. The EPA promulgated rules for hazardous waste disposal under the Resource Conservation and Recovery Amendments to the Solid Waste Disposal Act on May 19, 1980, at 45 Fed. Reg. 33084. Those standards do not include molybdenum which is proposed to be controlled under the UMTRCA disposal standards. Thus, the inclusion of molybdenum in the UMTRCA disposal rule proposal is inconsistent with the requirements of the Solid Waste Disposal Act and not in accordance with the UMTRCA.

3. EPA is authorized to promulgate standards applicable to disposal of uranium mill tailings from inactive sites under the Clean Water Act (CWA), Safe Drinking Water Act (SDWA), and Resource Conservation and Recovery Act (RCRA). However, such standards must be properly developed and promulgated in accordance with such applicable authority. (See for example, the procedure and methodology used in promulgating the toxic pollutant criteria, 45 Fed. Reg. 79318, November 28, 1980.) Molybdenum has not been designated a toxic or hazardous waste to be controlled under the CWA or RCRA, nor has the substance been included in the National Interim Primary Drinking Water Standards under SDWA. No clear authority is provided under UMTRCA for development of groundwater standards for materials other than those wastes which the Secretary of Energy has determined to present a radioactive hazard. EPA should not promulgate a standard for molybdenum in groundwater based upon insufficient authority where other legal authority (including established procedural methodologies) exist.

B. National Interim Primary Drinking Water Regulations

As stated above, the UMTRCA requires disposal standards to be consistent with the requirements of the Solid Waste Disposal Act. It does not require consistency with the National Interim Primary Drinking Water Regulations (NIPDWR). Nevertheless, these regulations are relied on by EPA in its proposal at 46 Fed. Reg. 2559 for the proposed groundwater protection standards. Even if consistency with the NIPDWR were a factor required by the UMTRCA, such groundwater protection standards should not be promulgated unless they have been shown to be necessary under the detailed standard setting process afforded substances controlled under NIPDWR, 40 C.F.R. Part 141. While this may be the case for some of the nonradiological substances listed (As, Ba, Cd, Cr, Pb, Hg, N, Se, Ag), it is not the case for molybdenum inasmuch as the NIPDWR do not even include molybdenum. Hence, if EPA believes consistency with the NIPDWR is a factor in this action, no molybdenum standard should be promulgated.

II. Toxicity Level of Molybdenum

A. Determination of Toxicity Level

As stated above, it is our position that EPA has no authority to promulgate a standard for molybdenum as a part of the disposal standards for inactive uranium processing sites. However, assuming that EPA had the legal authority to do so, and acknowledging that EPA has the legal authority under other federal legislation to do so, it is our position that the status of available knowledge concerning the toxicity level of molybdenum denies that a standard is justifiable at this time.

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We have been informed by Dr. Stanley Lichtman that all available knowledge concerning the toxicity level of molybdenum to humans is summarized in Section C.7, Appendix C of the Draft Environmental Impact Statement for Remedial Action Standards for Inactive Uranium Processing Sites (DEIS) USEPA, EPA 520/4-80-11, December, 1980. Dr. Lichtman informed us that no additional criteria document exists supporting the proposed molybdenum standard and that the level decided upon for the proposed standard, 0.05 mg/l Mo in drinking water, was based on Human Health Effects of Molybdenum in Drinking Water, Chappell, et al., EPA-600/1-79-006, USEPA, January 1979, p. 77. This study found no biochemical changes in humans at that level. Other levels could have been as easily decided upon, as no biochemical changes were experienced at drinking water levels below 0.1 mg/l and a majority of subjects showed no biochemical changes at much higher levels. Chappel, pp. 75-77. In fact, no human health effects were observable at any level of consumption of molybdenum of less than 1.5 mg per day. Chappel, pp. 64-77. Assuming that ingestion in food averages 0.21 mg of molybdenum per day and a 2 liter per day water consumption*, a concentration of molybdenum in water of 0.645 mg/l would be required to reach this daily intake of 1.5 mg per day.

Chappell states that "It is not likely that a drinking water standard for molybdenum is required. But we believe that 50 ug Mo/L represents a prudent guideline". Chappell p. 5. His justification for this 50 ug Mo/L guideline is stated as "Since no biochemical changes were found in subjects consuming water containing up to 50 ug Mo/L, it can be assumed that such a level does not cause any adverse biochemical or health effects" (emphasis added). Chappel, p.77. This assumption is hardly a scientific determination of a level of toxicity to be used for the setting of a standard by EPA.

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*The assumption of 2 liters/day of water consumption for an average adult male is the figure used by Chappell; however, we believe this figure to be rather high. The figure is also used in the assumptions for the Water Quality Criteria promulgated under section 304 of the Clean Water Act, 45 Fed. Reg. 79324, November 28, 1980.

Although Chappell found no level of minimum sufficient dietary intake of molybdenum (Chappell, p. 65), a 1975 paper entitled "Defining Trace Element Deficiencies and Toxicities in Man", Walter Mertz, Agriculture Research Service Nutrition Institute, U. S. Department of Agriculture, reached a tentative conclusion "that a molybdenum concentration of 150-1000 ug in the diet is probably safe and sufficient." Mertz, pp. 13 and 14. Mertz studied the question of dietary deficiency of molybdenum as well as its excess. In this regard, Mertz stated:

> It is important to know that it is not only the excess of a trace element which is unsafe, but equally important, the deficiency. Although man's activities are better known for their introduction of excessive levels into the environment they can also result in deficiencies. Mertz, p. 1.

The Mertz paper interpreted the same studies utilized by Chappell to conclude that molybdenum intakes of 1.5 mg/day do not appear to have any noticeable health effects. Mertz, p. 12. As previously noted, this figure translates to a concentration of 0.645 mg/l via drinking water, assuming a daily intake of 2 liters of water-based liquids and 0.21 mg Mo in food.

Chronic toxicity has been experienced at daily intake levels of 10 to 15 mg of molybdenum. DEIS, p. C-7; Mertz, pp. 11 and 12. A chronic toxicity threshold of 10 to 15 mg

per day (Mertz, p. 12) is equivalent to a chronic toxicity concentration in water of 4.895 to 7.395 mg/l, assuming 0.21 mg of molybdenum intake via food and 2 liters/day of water consumption.

The Chappell and Mertz studies show that significant differences exist in the interpretation of the available information about molybdenum toxicity. The EPA has even further exacerbated these differences by applying the inconclusive results of these studies to groundwater quality rather than drinking water as was the subject of the research performed. It is apparent that, based on the information available at this time, the establishment of an appropriate molybdenum standard for either ground or drinking water represents little more than a guess. For any standard to be enforceable, it should be capable of withstanding careful scientific scrutiny. The proposed standard of 50 ug/l most certainly does not meet this test.

This guesswork is clearly distinguishable from the detailed procedures and methodologies employed by EPA in the establishment of water quality criteria for 65 toxic pollutants. See 45 Fed. Reg. 79318 et seq., November 28, 1980. In summary, we do not believe that the proposed molybdenum standard of 0.05 mg/l will withstand sceintific scrutiny. Rather, it appears that its inclusion is an arbitrary and capricious action unsupported by substantial evidence.

B. Proposed Molybdenum Level

1. The proposed molybdenum standard was selected by EPA "on the basis of avoiding toxic effects in humans." 46 Fed. Reg. 2559. The proposed molybdenum standard does not represent a threshold of hazard to human health, but instead is only an assumption presumably on the basis of one study.

Remarkably, as noted previously, this study recommends that "It is not likely that a drinking water standard for molybdenum is required. But we believe that 50 ug Mo/L represents a prudent guideline". Chappell, p.5.

Even under EPA's more expansive interpretation of its legal authority with which we disagree, EPA has authority to promulgate standards for the protection of public health and safety from hazards. The study cited shows that the .05 mg/l level for molybdenum is related only to the absence of any biochemical changes and does not define a level in excess of which might represent a hazard to human health.

It should be noted that molybdenum is not listed as a hazardous or toxic substance under the Resource Conservation and Recovery Act or under the Clean Water Act. Neither is it included in any Effluent Limitation Guidelines for Standards of Performance for specific industry subcategories. Molybdenum is not listed in "Quality Criteria for Water" (the Redbook) nor is it included in the recent (November 1980) EPA publication of Water Quality Criteria or in the National Interim Primary Drinking Water Regulations. The justification, therefore, for a standard for molybdenum in either surface or groundwater has not been sufficiently substantiated to warrant promulgation.

2. In addition to consideration of the potential human health effects of molybdenum in drinking water, the proposed standard for molybdenum is presumably based upon a consideration of its potential mobility through groundwater. DEIS, pp. 4-38. However, molybdenum is not listed in the DEIS as having a high probability of being mobile. DEIS, pp. 4-34. Only certain anions of molybdenum are deemed to be even relatively mobile, and such determination is based upon admittedly "extremely limited" data. DEIS, pp. 4-35. The mobility of molybdenum from uranium mill tailings is thus

indeterminate at this time and represents a much lower potential risk of hazard to human health and the environment than EPA's proposal suggests.

EPA states that prevention or reduction of seepage of known high mobility substances (e.g., selenium and zinc) should control those other substances for which no confirming data are available (e.g., molybdenum). Ibid. Therefore, EPA need not promulgate a standard for control of molybdenum, which is a less mobile substance than selenium or zinc, even if the toxicity levels of molybdenum were such as to warrant the establishment of a standard.

In summary, therefore, notwithstanding the legalities of whether the UMTRC provides EPA the authority to promulgate a groundwater standard for molybdenum, it is our opinion that such a standard under this Act is inappropriate and unnecessary and should be deleted from the final regulation.

Gentlemen:

My name is Victor Lescovitz, I am a state representative from the 46th Legislative District in the Commonwealth of Pennsylvania. My district includes parts of Washington and Beaver Counties, two counties in the western end of the state.

In recent months, there has been a great deal of local attention focused on the Canonsburg Industrial Park in Canonsburg, Washington County, Pennsylvania, which is one of the 25 sites around the country designated for remedial action under Public Law 95-604, the Uranium Mill Tailings Radiation Control Act of 1978. Along with the attention has come a great deal of misinformation which has generated unnecessary fear on the part of local residents. While the Canonsburg site is not located in my district, it is located only a few miles away, and several sites have been chosen for relocation of the waste, two of which lie in my district. Accordingly, I have been contacted by a number of residents who are concerned with what will be done with the waste, and what kind of measures will be taken to ensure that the waste is made secure and that no further contamination will occur.

I believe that citizen participation in matters of this nature is of the utmost importance, both to calm the fears of anxious residents and to provide them with some kind of input. That is the reason I have asked to testify here today.

I was first made aware of these hearings by an advertisement which appeared in the Monday, May 11, edition of the Pittsburgh Post-Gazette. In a matter of such importance to so many Western Pennsylvanians, four days notice is hardly enough time for anyone to plan a trip to Washington and prepare testimony for a public hearing, nor is it financially feasible for most citizens in my area who would be interested in appearing, to make a trip to Washington. Also, until I saw the ad, I was not aware that EPA had set a June 15 deadline for public comment on these proposed uranium cleanup and disposal standards. The timing of the advertisement and the location of

the hearing itself has effectively precluded any participation by concerned citizens from my area.

Further, of the 25 inactive uranium mill sites in the United States, the Canonsburg Industrial Park is the only site in the Northeast. Given this, it seems only fair that the citizens of Western Pennsylvania be given the same opportunity to present their views as the people of Salt Lake City, Utah, and Durango, Colorado, where, I understand, public hearings were held prior to this one.

Also, the conditions surrounding the Canonsburg site are different than those surrounding sites in the West. Geologic an environmental conditions are not the same, not to mention the difference in population density. The site in Canonsburg is a mere 15 miles from Pittsburgh.

In addition, I have a number of questions concerning certain sections of the proposed standards which illustrate the need for further discussion. On page 2558 of the Federal Register of January 9, 1981, you readily admit that "no disposal method has been tested sufficiently to establish its practicality or effectiveness over long periods of time." Also, in a footnote on the same page, you remark that "some processes occurring in tailings piles tend to carry dissolved contaminants upward, perhaps even through soil coverings." Yet burial in permeable barriers such as soil is one option which is considered in the proposed standards. Perhaps additional time is needed for public contribution so that some of these questions can be cleared up.

Also in Subpart C - Exceptions, the proposed standards, state that provisions may be made for exceptional circumstances. Would the Canonsburg site, because of the population density of the surrounding area, be considered under this section for special remedial action? The waste site, as well as proposed relocation sites, is well within the Pittsburgh metropolitan area, and is within a few miles of a number of small boroughs, as well as a major airport.

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Further, the proposed standards do not address the problem of transporting the mill tailings to other sites as one possible remedial action. One proposal that has been offered as a remedy to the Canonsburg problem is to transport the material some 18 miles to sites which supposedly could better meet safety requirements. Nowhere in the proposed standards is there any provision for transportation of radioactive mill tailings.

Based on these factors, I ask that the EPA extend a similar courtesy to the citizens of Western Pennsylvania, and hold public hearings in Canonsburg, or at least in the area, on the subject of the proposed standards for cleanup and disposal of mill tailings, and that the June 15 deadline for public comment be extended to give citizens ample time to voice their concerns and provide information which may be helpful to EPA in their consideration of this matter.

Thank you for the opportunity to come here and testify.

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Majority Caucus Chairman

Senate of Pennsylvania

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TRANSPORTATION
URBAN AFFAIRS & HOUSING

STATE-FEDERAL ASSEMBLY COMMITTEE
ON ENERGY
STATE COUNCIL OF CIVIL DEFENSE

May 14, 1981

Mr. Stan Lichtman
U.S.E.P.A.
401 M Street
South West
Washington, D.C. 20465

Dear Mr. Lichtman:

I would like to thank the Environmental Protection Agency for allowing me the opportunity to submit the following remarks at the public hearing being held this day, May 15, 1981 in Washington, D.C.

As you are aware, the Uranium Mill Tailings Radiation Control Act of 1978 has designated Canonsburg, Pennsylvania as a site to be included in the remedial action program to stablize and control uranium mill tailings in a safe and environmentally sound manner.

Within the past month, the Pennsylvania Department of Environmental Resources has researched possible disposal sites within the Commonwealth. Two of these sites which have received much public attention and labeled by the Department of Environmental Resources as the most promising locations for disposal fall within the boundaries of my Senatorial District in the Township of Hanover. I, as well as many others, have gone on record in opposing the transfer of this material from Canonsburg to Hanover Township or any other area within the state. It is my belief that all efforts should be concentrated toward the stablization of this material at the Canonsburg site.

In reviewing Public Law 95-604, I have found that it is the E.P.A.'s responsibility to promulgate standards for the clean up and disposal of radioactive materials from the uranium processing sites located throughout the United States.

I commend the E.P.A. for scheduling public meetings such as this one held today for the purpose of providing public participation. Given the fact that Canonsburg is the only site located in the eastern half of the United States, I believe that the residents of Pennsylvania should be afforded the opportunity of a public hearing in their state. I am, therefore, requesting that the E.P.A. hold a public hearing in Washington County, Pennsylvania prior to the establishment of formal standards, rules and regulations governing the disposal of radioactive uranium mill tailings.

Your attention and approval of our request is greatly appreciated and we look forward to your response as soon as possible.

Thank you very much for your consideration.

Sincerely,

James E. Ross

JAMES E. ROSS

JER:adr:kac

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